

PROJECT MANUAL



SWIFT CREEK ELEMENTARY SCHOOL RALEIGH, NORTH CAROLINA WAKE COUNTY PUBLIC SCHOOL SYSTEM

BID SET
APRIL 10, 2024




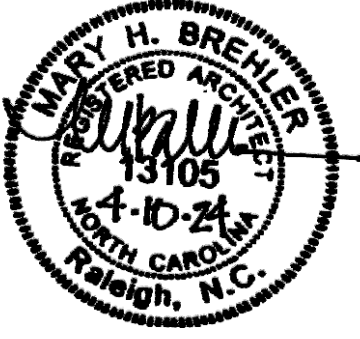


434 Fayetteville Street, Suite 1700
Raleigh, North Carolina 27601
Phone: 919-829-2700
Fax: 919-829-2730





LS3P COMMISSION NUMBER 8201-207411


VOLUME No. 1 of 2

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DOCUMENT 000107 – PROJECT DIRECTORY AND SEALS PAGES

<p>ARCHITECT</p> <p>434 Fayetteville Street, Suite 1700, Raleigh, NC 27601 919.829.2700</p>	<p>LS3P Corporate License #50417</p>	
<p>ARCHITECT</p> <p>434 Fayetteville Street, Suite 1700, Raleigh, NC 27601 919.829.2700</p>	<p>Mary H Brehler License #13105</p>	
<p>ROOFING CONSULTANT</p> <p>Terracon 2701 Westport Rd I Charlotte, NC 28208 (704) 594-8931</p>	<p>Vu The Nguyen RRC License #0648</p>	
<p>CIVIL ENGINEER</p> <p>McAdams 621 Hillsborough Street, Suite 500 Raleigh, NC 27603 (919) 361-5000</p>	<p>Eric M Domonell License #047504</p>	

<p>LANDSCAPE ARCHITECT</p> <p>McAdams 621 Hillsborough Street, Suite 500 Raleigh, NC 27603 (919) 361-5000</p>	<p>Brian T. Kisko License #: 2126</p>	
<p>STRUCTURAL ENGINEER</p> <p>Lynch Mykins 301 N West St #105, Raleigh, NC 27603 919.782.1833</p>	<p>Jeffrey R. Morrison License #: 027813</p>	
<p>PLUMBING ENGINEER</p> <p>CMTA 10411 Meeting Street Prospect, KY 40059 502.469.6477</p>	<p>Douglas R. Hundley License #: 032218</p>	
<p>MECHANICAL ENGINEER</p> <p>CMTA 10411 Meeting Street Prospect, KY 40059 502.469.6477</p>	<p>Douglas R. Hundley License #: 032218</p>	

<p>ELECTRICAL ENGINEER</p> <p>CMTA 10411 Meeting Street Prospect, KY 40059 502.469.6477</p>	<p>Stephen E. Robey License #: 043650</p>	 A circular professional engineer seal for Steve E. Robey. The outer ring contains the text "NORTH CAROLINA" at the top and "STEVE E. ROBES" at the bottom. The inner ring contains "PROFESSIONAL" at the top and "ENGINEER" at the bottom. The center of the seal contains the text "SEAL" and "043650".
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DOCUMENT 003132 - GEOTECHNICAL DATA

1.1 GEOTECHNICAL DATA

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.
- B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.
- C. A geotechnical investigation report for Project, prepared by Terracon Consultants, Inc., dated April 8, 2022, is appended to this Document.
 - 1. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
 - 2. Any party using information described in the geotechnical report shall make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.

END OF DOCUMENT 003132

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Geotechnical Engineering Report

**Proposed Swift Elementary School
Raleigh, North Carolina**

April 8, 2022

Terracon Project No. 70215172

Prepared for:

Wake County Public School System
Cary, North Carolina

Prepared by:

Terracon Consultants, Inc.
Raleigh, North Carolina



April 8, 2022

Wake County Public School System
111 Corning Road, Suite 190
Cary, North Carolina 27518



Attn: Mr. Jason Reynolds, Senior Project Manager
P: (919) 588-3581
E: jrreynolds@wcpss.net

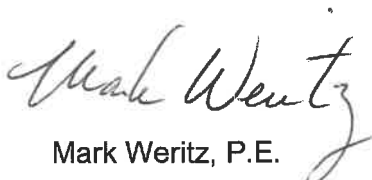
Re: Geotechnical Engineering Report
Proposed Swift Elementary School
5610 Tryon Road
Raleigh, North Carolina
Terracon Project No. 70215172

Dear Mr. Reynolds:

Terracon Consultants, Inc. (Terracon) has completed geotechnical engineering services for the proposed school project in accordance with our Proposal No. P70215172, dated July 21, 2021. This report presents the findings of the subsurface exploration and provides geotechnical recommendations regarding earthwork and the design of foundations, floor slabs, and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.



Mark Weritz, P.E.
Senior Engineer



Andrew A. Nash, P.E.
Geotechnical Department Manager
Registered NC 031022

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REPORT SUMMARY

Topic ¹	Overview Statement ²
Project Description	We understand that WCPSS plans to demolish existing school buildings and pavements, and construct a new, two-story, “L“-shaped school building, with surrounding driveways, parking lots, playfields, and a boardwalk/wetland area.
Geotechnical Characterization	<p>The native soil profile consists of weathered, fine-grained (silt/clay), residual soils with variable plasticity and sand content. Residual soils were found mostly in a medium stiff to very stiff condition, with occasional soft zones. High plastic clays with plasticity indices (PIs) greater than 30 were identified on site. Soft to medium stiff existing fill was found within the proposed building footprint, and elsewhere across the project site.</p> <p>Groundwater was found to range between depths of 7.3 and 11.2 feet within test borings drilled within the western portion of the site.</p>
Earthwork	<p>Maintenance of effective site drainage will be critical during and after construction.</p> <p>Existing buildings, pavements, and most utilities will require demolition and removal off-site. If any existing fill is intended to remain in place beneath new construction, there is an inherent risk to the owner that soft or unsuitable material within or buried by existing fill will not be discovered during construction. This risk of unforeseen conditions can be reduced by performing additional site testing and evaluation.</p> <p>Construction of the building pad, and other large areal earthfills, can induce ground settlements on the order of 1 to 3 inches. We recommend that sufficient time be given to allow ground settlement to occur before initiation of foundation or site construction.</p>
Foundations	<p>If existing fill is removed and replaced with structural fill within the building footprint, foundations designed with an allowable contact pressure of 2,500 psf, and bearing on approved native soils or structural fill, can support wall and column loads.</p> <p>Due to the large volume of existing fill within the building footprint, it may prove economical to leave existing fill soils in place, and improve both native subgrade and existing fill soils with rammed aggregate piers (RAPs) to support building foundations. A RAP designer can generally provide a design contact pressure in the range of 4,000 to 8,000 psf for foundations supported on RAP modified subgrade.</p>
Slab-on-Grade and Pavement Subgrade Preparation	<p>Ground level slabs can also be supported on RAP modified subgrade, however, if RAPs are intended to support building foundations only, we recommend that all existing soils within 3 feet of FFE are overexcavated and replaced with engineered fill consisting of approved material placed on approved soil subgrade.</p> <p>Where present within 2 feet of finished pavement grade, we recommend overexcavation of high plastic soils (PI greater than 30), and replacement with structural fill, or lime treatment of pavement subgrade.</p>
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Geotechnical Engineering Report
Proposed Swift Elementary School
5610 Tryon Road
Raleigh, North Carolina
Terracon Project No. 70215172
April 8, 2022

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed Swift Creek Elementary School project at 5610 Tryon Road at Raleigh, North Carolina. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Excavation considerations
- Seasonal High Groundwater Evaluation
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per IBC
- Lateral earth pressures
- Pavement design and construction

The geotechnical engineering Scope of Services for this project included the advancement of twenty-four test borings, B-1 to B-24, to depths between 10 and 20 feet below existing site grade. An additional six test borings, A-1 to A-6, were drilled to a depth of 25 feet below grade within the western part the site during a 2018 site investigation of a 4-acre site portion formerly known as the Mann Parcel.

Maps showing the site and boring locations are shown on the **Site Map** and **Exploration Plans**, respectively. Results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and as a separate graph in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Geotechnical Engineering Report

Proposed Swift Elementary School ■ Raleigh, North Carolina

April 8, 2022 ■ Terracon Project No. 70215172



Item	Description
Location	<p>The Swift Creek Elementary School project site consists of the existing school building complex and adjoining areas located at the southwest corner of the intersection of Tryon Road and Yates Mill Pond Road in Raleigh, North Carolina. The project site comprises approximately 13 acres.</p> <p>latitude 35.744°, longitude -78.734°</p>
Existing Improvements/Ground Cover	<p>The northeast and central eastern portions of the site are currently occupied with several existing one- to two-story school buildings. A paved parking lot is located at the northeast corner of the site, and a concrete retaining wall is located along its southern perimeter.</p> <p>Two smaller paved parking lots and driveways are located immediately south of the school buildings. A soccer field, tennis courts, and a public restroom building are located within the mid-southern portion of the site. A wooded area is present at the extreme southern portion of the project site.</p> <p>The northwestern portion of the project property (former Mann parcel) was previously used as a residence and a commercial landscape nursery.</p>
Existing Topography (Wake County GIS)	<p>The project site slopes downward from its north (el 480 feet) to its south (el 440 feet). A south-draining, natural swale bisects the former Mann parcel and continues southward into the wooded, southern portion of the project site.</p>
Geology	<p>Soils at the site are residual in nature and developed from severe weathering of parent bedrock. According to the 2004 Preliminary Bedrock Geologic Map of the Raleigh 30' x 60' Quadrangle, North Carolina, the site is located within the mapped extent of the Richland Creek Schist of the Crabtree Terrane. The Richland Creek Schist is described as a silver gray, well-foliated, pelitic schist, and tan to white, fine-grained, moderately foliated felsic gneiss.</p>

PROJECT DESCRIPTION

Our understanding of the project conditions is as follows:

Item	Description
Information Provided	<p>Preliminary Overall Grading Plan, C3.00, undated, which shows a new elementary school building and surrounding driveways, parking lots, playgrounds, playfields, and a boardwalk/wetland area.</p>
Project Description and Proposed Structures	<p>We understand that the WCPSS plans to demolish existing school buildings and pavements, and construct a new, two-story, "L"-shaped school building, surrounding driveways, parking lots, playgrounds, playfields, and a boardwalk/wetland area.</p>
Finished Floor Elevation	<p>The finished floor elevation of the new school building is el 464 feet.</p>

Geotechnical Engineering Report

Proposed Swift Elementary School ■ Raleigh, North Carolina

April 8, 2022 ■ Terracon Project No. 70215172



Item	Description
Maximum Loads (assumed)	<ul style="list-style-type: none">■ Columns: 200 kips perimeter, 300 kips interior■ Walls: 4 to 8 kips per linear foot, klf■ Slabs: 150 pounds per square foot (psf)
Grading/Slopes	<p>Most of the site exterior north of the new building will be graded with cuts and fills on the order of 2 to 5 feet. The low area south of the new school building will be filled up to 10 feet above existing grade. Abrupt changes in cuts and fills should be anticipated in areas of existing buildings, pavements and utilities that are planned for demolition.</p> <p>The west end and northwest corner of the building pad will be cut up to 3 feet below existing grade. The remainder of the building pad will be filled to grade. The west central and southwestern portions of the building pad will be filled up to 10 feet above existing grade.</p>
Site Retaining Walls/Basement Walls	<p>At least two site retaining walls are shown on the preliminary grading plan. Maximum wall heights are 4 to 9 feet.</p> <p>No below grade areas are anticipated to be constructed for this project.</p>
Pavements	<p>New pavements are assumed to consist of heavy-duty asphalt paving for new driveways (150,000 ESALs), and light-duty asphalt paving for automobile parking areas (25,000 ESALs). The pavement design period is assumed to be 20 years.</p>

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs and GeoModel profiles can be found in the [Exploration Results](#) section of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
01	Existing Fill	Silty/Clayey Sand, or Silt/Clay with variable plasticity and sand content.
02	Residual Soil	Silty/Clayey Sand, or Silt/Clay with variable plasticity and sand content, micaceous, relict schist structure at lower depths. Occasional silty sand to sandy clay surficial layer.

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Several significant areas of existing fill are present across the site. A large existing fill area is located beneath pavements and open areas south of the existing buildings, which extends to depths of 3 to 7 feet at test boring locations. Other existing fill areas were encountered at the B-17 test boring location (northeast corner of the site), and at the B-21 and B-24 locations (southern end of the site). As the site has been developed multiple times, other zones of existing fill should also be anticipated across the site.

Test borings were observed during and immediately after drilling for the presence and level of groundwater. The A-series test borings on the former Mann parcel were checked for 24-hour water levels, which were found to range between depths of 7.3 and 11.2 feet at the time of the 2018 investigation. Groundwater levels were not found above cave-in depths in B-series test borings.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

A seasonal high groundwater evaluation report, prepared by a soil scientist, is attached to this geotechnical report.

GEOTECHNICAL OVERVIEW

Subsurface Conditions

Within 25 feet of the ground surface, the native soil profile consists of weathered, fine-grained (silt/clay), residual soils with variable plasticity and sand content. Residual soils were found mostly in a medium stiff to very stiff condition, with occasional soft zones. A surficial layer of silty/clayey sand or sandy clay was occasionally found atop residual soils. High plastic fine-grained soils, with a plasticity index greater than 30, were identified on site. Groundwater was measured at depths between 7.3 feet and 11.2 feet in test borings located within western portion of the site. Further details regarding subsurface conditions are summarized in **Geotechnical Characterization**.

Existing Fill

Existing fill was encountered in test borings within the eastern and southern portions of the site, especially beneath pavement areas south of the existing school buildings. Existing fill was found to mostly consist of soft to medium stiff sandy silt/clay soils. The bottom of existing fill extends to depths of approximately 3 to 7 feet at test boring locations.

Before or during initial stages of site development, we recommend test pit exploration of any existing fill that is proposed to remain in place in order to evaluate its suitability as structural fill as subgrade for pavements or structures. Despite recommended evaluation and construction procedures, there is an inherent risk to the owner that compressible fill or unsuitable material within or buried by the fill will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill but can be reduced by recommendations presented in this report.

Foundation and Floor Slab-on-Grade Considerations

The volume of existing fill within the southern and eastern portions of the proposed building footprint is estimated to be on the order of 10,000 cubic yards. As existing fill was found to primarily consist of soft to medium silt/clay soils, it would be customary to remove and replace existing fill within the proposed building footprint. However, due to the large volume of existing fill within the proposed building footprint, it may prove economical to leave existing fill soils in place, and **improve both native subgrade and existing fill** soils with rammed aggregate piers (RAPs) to support building foundations. A RAP designer/installer can generally provide a net allowable bearing pressure that ranges between 4,000 and 8,000 psf. Additional site exploration using cone penetrometer test (CPT) probes can provide more subsurface information to efficiently design RAPs for the building pad. Further details regarding shallow foundations are summarized in **Foundations**.

If RAPs are intended to only support building foundations and not floor slabs, we recommend that all existing soils within 3 feet of the finished floor elevation are overexcavated and reworked or replaced with engineered fill consisting of approved fill material placed on approved existing soil subgrade.

If existing fill is entirely removed from the proposed building footprint and replaced with structural fill, shallow conventional foundations bearing on approved native soil or structural fill subgrade can be designed with an allowable contact pressure of 2,500 psf. Soils with a PI greater than 30 within 3 feet of finished grade should be removed and replaced with approved structural fill. Construction of building foundations can proceed after rate of building pad settlement induced by fill placement has reached acceptable rates determined by the geotechnical engineer.

Fill Induced Ground Settlement & Settlement Monitoring

Construction of the building pad, and other large areal earthfills, can induce ground settlements on the order of 1 to 3 inches. We recommend that sufficient time be given to allow ground settlement to occur before initiation of foundation construction. Most ground settlement will occur during earthwork; however, we recommend settlement monitoring of top of fill for at least two weeks before placement of any sitework or structural concrete. Foundation/site construction can begin after ground settlement rates have been determined to have reached acceptable rates determined by the geotechnical engineer.

Soil Moisture Control & Placement of High Plastic Soils

Surface drainage within the existing topographic swale at the west end of the site is currently directed toward the western half of the building footprint. **We strongly recommend interception and diversion of upgradient surface runoff around proposed building areas as early as possible.** Effective site drainage will be essential during construction to prevent any ponding or erosion of exposed or buried subgrade soils.

High plastic soils ($PI > 30$) have been identified on site. These soils can exhibit significant shrink-swell movements with changes in moisture, which can be potentially expansive, and can readily lose shear strength when exposed to wet conditions and/or heavy traffic. These soils can be difficult to work with and could require special measures, which can include removal and replacement, or lime treatment, during site earthwork.

Approved on site soils can be excavated and used as fill material; however, it is critical that soil moisture is controlled and maintained throughout construction. Also, soils containing higher proportions of high plasticity soil (PI greater than 30) should be limited in their use as structural fill to lower portions of deeper fill zones and should not be used directly beneath pavements or floor slabs. It may be necessary to excavate and replace localized pockets of higher plasticity soils when these materials are present at planned subgrade. Soils with plasticity indices greater than 30 should not be used within 3 feet of finished grade for buildings (2 feet of finished grade for pavements), nor used as backfill behind retaining walls or basement walls.

Near-surface soils will generally provide a relatively stable subgrade for construction equipment when they are dry. Clayey/silty soils are moisture-sensitive, and can become unstable when they are wet, resulting in excessive rutting or deflection under construction traffic. Moisture-related earthwork difficulties can be reduced by performing the earthwork during the typically drier months of the year (May through September) and after a period of dry weather. Moisture-related earthwork difficulties also can be reduced by keeping exposed subgrades sloped to promote surface water runoff. Placing a 4- to 6-inch-thick layer of “crusher-run” stone (NCDOT ABC) or dense graded aggregate (NCDOT Type A or B) over a prepared subgrade or geotextile fabric also will protect the subgrade from excessive moisture infiltration and damage from construction traffic.

To the extent practical, construction should be performed during the summer and fall due to the shorter duration of precipitation and increased drying potential associated with these seasons. This does not necessarily preclude performing earthwork during other times of the year; however, increased remedial measures due to soft, unsuitable conditions should be expected if earthwork is performed during other times of year. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

Earthwork is anticipated to include clearing/grubbing of landscaping, demolition, excavations, and fill placement. Effective site drainage will be essential before, during and after construction. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.

Site Preparation

After demolition work and prior to fill placement, existing vegetation and woody debris should be removed from work areas. Stripped materials consisting of vegetation and organic materials should be wasted off-site, or reused appropriately in proposed landscaped areas.

Existing structures and utilities that are to be abandoned and demolished should be properly decommissioned, removed or filled with grout within the proposed construction areas. Utilities to remain in place should be accurately located horizontally and vertically to minimize potential conflicts with new construction. Existing pavements adjacent proposed building areas can remain in place (or rubblized in place) during construction to protect site subgrade from construction traffic.

After demolition, stripping, and grubbing, exposed soils in areas to receive fill, and in cut areas, should be proof-rolled to detect soft, unstable, or otherwise unsuitable soils. Proof-rolling should be performed with a moderately loaded, tandem-axle dump truck or similar rubber-tired construction equipment. The proof-rolling operations should be observed by a representative of the geotechnical engineer and should be performed after a suitable period of dry weather to avoid degrading an otherwise acceptable subgrade.

Highly plastic soils, such as fat clay and elastic silt, were encountered at varying locations and depths within test borings. Experience indicates highly plastic soils do not perform well when exposed at subgrade elevations due to their potential to shrink and swell with changes in moisture content. Highly plastic soils (plasticity index greater than 30) should be removed where present within 3 feet of finished grade. Highly plastic materials may be reused in deep fill sections, but not behind retaining walls.

Exposed subgrade to receive structural fill, on-grade structures, or other site features should be proof-rolled with an adequately loaded vehicle such as a fully loaded tandem axle dump truck. The proof-rolling should be performed under the direction of the Geotechnical Engineer. Areas excessively deflecting under the proof-roll should be delineated and subsequently addressed by the Geotechnical Engineer. Excessively wet or dry material should either be removed or moisture conditioned and recompacted.

Fill Material Types

Fill required to achieve design grade should be classified as structural fill or general fill. Structural fill is material used below, or within 10 feet of structures or pavements. General fill is material used to achieve grade outside of these areas. Earthen materials used for structural fill should meet the following material property requirements:

Fill Material	USCS Classification	Acceptable Location for Placement
Imported or On-Site Low-to Moderate-Plasticity Soil (min. 20% fines)	CL, ML, CL-ML, SC, SM, SC-SM	All locations and elevations except as backfill behind retaining walls or mechanically stabilized earth walls
Sand / Gravel with less than 10% fines ²	GW/GP, SW/SP	NCDOT ABC – beneath slabs, pavements / sidewalks or as a replacement material for over-excavated soils.
High Plastic Soils	CH, MH	High plastic soils, with plasticity indices greater than 30, should not be used within 3 feet of finished grade for buildings or 2 feet of finished grade for pavements, nor used as backfill behind retaining walls or basement walls

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. A sample of each material type should be submitted to the geotechnical engineer for evaluation.
2. Soil with less than 10% fines (silt and clay) should not be used as general fill to raise site grades to prevent perched water conditions where water infiltrating the surface zone can be trapped over the underlying less-permeable soil zone.

Fill Compaction Requirements

Structural and general fill should meet the following compaction requirements.

Item	Description
Fill Lift Thickness	9-inches or less in loose thickness (4-inch to 6-inch lifts when hand-operated equipment is used).
Compaction Requirements ¹	Minimum of 95% of the material's standard Proctor maximum dry density (ASTM D698). The top lift of engineered fill should be compacted to a minimum of 98% of the material's standard Proctor maximum dry density (ASTM D698) for buildings and pavements.
Moisture Content	Within the range of -1% to +3% of optimum moisture content as determined by the standard Proctor test.

1. Engineered fill should be tested for moisture content and compaction during placement. If in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the tests should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

Utility Trench Backfill

Utility trenches are a common source of water infiltration and migration. Utility trenches penetrating the building perimeter should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the building. The trench should provide an effective trench plug that extends at least 5 feet from the face of the building exterior. The plug material should consist of cementitious flowable fill or low permeability clay. The trench plug material should be placed to surround the utility line. If used, the clay trench plug material should be placed and compacted to comply with the water content and compaction recommendations for structural fill stated previously in this report.

Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

Exposed ground should be sloped and maintained at a minimum 5% away from the building for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

As previously mentioned, a drainage feature that starts in the northwest (Old Mann parcel) near Tryon Road and flows southeast across the site. The water from this drainage ditch will need to be collected in a storm water system.

Earthwork Construction Considerations

Shallow excavations are anticipated to be accomplished with conventional construction equipment. We recommend undercutting soft or highly plastic materials (PI greater than 30) within the building footprint and pavement subgrade and replacement with structural fill, or ABC. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of floor slabs. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material

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should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

Earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation and topsoil, proofrolling, evaluation of existing fill, and mitigation of areas delineated by the proofroll to require repair.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. One density and water content test should be performed for every 50 linear feet of compacted utility trench backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. If unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

We recommend that sufficient time be given to allow ground settlement to occur before initiation of foundation construction. A settlement monitoring program, reviewed by the geotechnical engineer, should be utilized to determine the appropriate time to allow initiation of foundation construction. If the site has been prepared in accordance with the requirements noted above and in the **Earthwork** section of this report, the following design parameters are applicable for shallow foundations.

Shallow Foundation Design Recommendations (Existing Fill removed and replaced with Structural Fill)

Structural loads can be supported on shallow footings that bear on properly prepared native soils, or approved engineered fill, provided that all existing fill is removed from the structure footprint. An allowable bearing pressure of 2,500 psf can be used to design column or wall foundations. Some localized undercutting of footing excavations and replacement with suitable material should be anticipated.

Shallow Foundation Design Parameters (All Existing Fill removed from structure footprint)

Description	Column	Wall
Net allowable soil bearing pressure ¹	2,500 psf	2,500 psf
Minimum dimensions	30 inches	18 inches
Minimum embedment	12 inches	12 inches
Estimated total settlement ²	< 1 inch	< 1 inch
Estimated differential settlement ²	1/2-inch between columns	1/2-inch over 50 feet
Equivalent fluid pressure ³	288 pcf	
Ultimate coefficient of sliding friction	0.30	

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Assumes any unsuitable fill or soft soils, if encountered, will be undercut and replaced with engineered fill. Disturbance of wet soils may require the need for a granular stabilization layer for an appropriate working surface. Terracon should be consulted if this issue becomes apparent.
2. The foundation settlement will depend upon the variations within the soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of compacted fill, and the quality of the earthwork operations.
3. The sides of the excavation for the spread footing foundation must be nearly vertical and the concrete should be placed neat against these vertical faces for the passive earth pressure values to be valid. If the loaded side is sloped or benched and then backfilled, the allowable passive pressure will be significantly reduced. Passive resistance in the upper 12 inches of the soil profile should be neglected.

A representative of the geotechnical engineer should be retained at the time of structural fill placement, and foundation construction to observe the subgrade preparation process. A combination of hand auger borings, dynamic cone penetrometer (DCP) testing, and probing should be performed to confirm the suitability of the subgrade materials for the design bearing pressure or placement of engineered fill. Should soft, very loose, or otherwise unsuitable materials be encountered, over-excavation and replacement with new engineered fill or lean concrete may be recommended.

Existing fill was found below the proposed building footprint as currently shown. In areas where existing fill remains under the proposed building the frequency of hand auger and DCP testing should be increased and should be extended to natural soils.

Shallow Foundation Design Recommendations (Rammed Aggregate Pier Modified Subgrade)

Structural loads can be supported on conventional spread or continuous foundations bearing on native soil or existing fill subgrade improved with rammed aggregate piers (RAPs). Allowable bearing pressures for foundations supported on RAP-modified subgrade generally range between 4,000 psf and 8,000 psf, and are to be provided by the RAP designer.

Rammed aggregate pier elements are typically constructed by drilling a hole, removing a volume of soil, and then building a column of crushed stone while vertically pre-stressing and pre-straining subsoils surrounding the column. The rammed aggregate pier designer/installer should provide final design details and settlement calculations sealed by a professional engineer licensed in the State of North Carolina. The settlement calculations should demonstrate that the rammed aggregate pier soil improved system will control long-term total and differential settlements to that required by the structural engineer. The specialty contractor should warrant their work as well as the maximum total and differential settlements they predict. We recommend the design parameters be verified by a full-scale modulus test (similar to a pile load test) performed in the field. Terracon should be retained to monitor the modulus test and subsequent production rammed aggregate pier installation.

Overlapping foundation stresses and fill induced settlements should be considered within the rammed aggregate pier design. Construction sequencing may affect overlapping stresses and therefore rammed aggregate pier design.

RAP-Improved Subgrade Foundation Design Parameters

Description	Value
Net allowable bearing pressure ¹	Bearing on RAP-improved subgrade: 4,000 to 8,000 psf ³
Minimum embedment below lowest adjacent finished grade ²	18 inches
Minimum width for continuous wall footings	16 inches
Minimum width for isolated column footings	24 inches
Approximate total settlement	Up to 1 inch
Estimated differential settlement	Less than ½ inch over 50 feet between interior columns.
Coefficient of friction (at interface between foundation concrete and improved ground)	0.35

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation.

2. For frost protection and protective embedment.

3. To be provided by rammed aggregate pier designer/installer.

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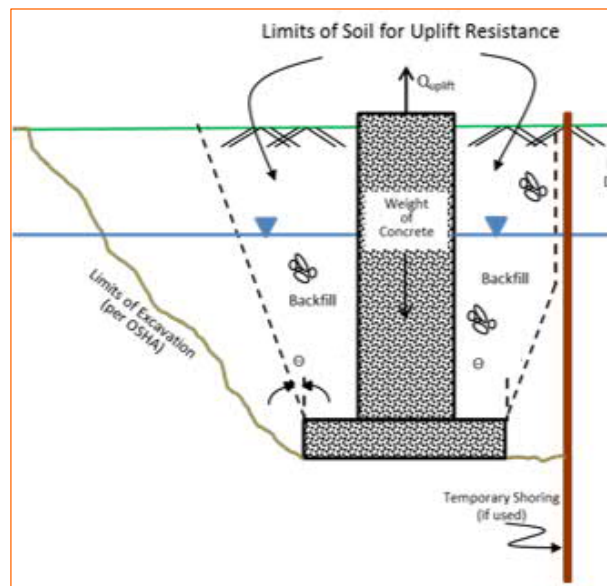
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The allowable foundation bearing pressure applies to dead loads plus design live load conditions. The design bearing pressure may be increased by one-third when considering total factored loads that include wind or seismic conditions. The weight of the foundation concrete below grade may be neglected in dead load computations. Interior footings should bear a minimum of 12 inches below finished grade. Finished grade is the lowest adjacent grade for perimeter footings and floor level for interior footings.

Footings, foundations, and masonry walls should be reinforced as necessary, with incorporation of control joints to reduce the potential for distress caused by differential foundation movement. Foundation excavations should be observed by the geotechnical engineer. If the soil conditions encountered differ from those presented in the original geotechnical report, supplemental recommendations will be required.

Design Parameters - Uplift Loads

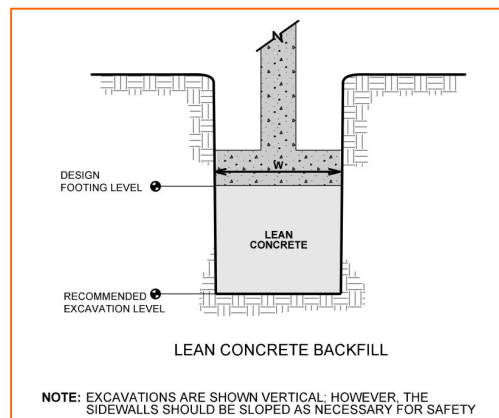
Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils. As illustrated on the subsequent figure, the effective weight of the soil prism defined by diagonal planes extending up from the top of the perimeter of the foundation to the ground surface at an angle, θ , of 20 degrees from the vertical can be included in uplift resistance. The maximum allowable uplift capacity should be taken as a sum of the effective weight of soil plus the dead weight of the foundation, divided by an appropriate factor of safety. A maximum total unit weight of 100 pcf should be used for the backfill. This unit weight should be reduced to 40 pcf for portions of the backfill or natural soils below the groundwater elevation.



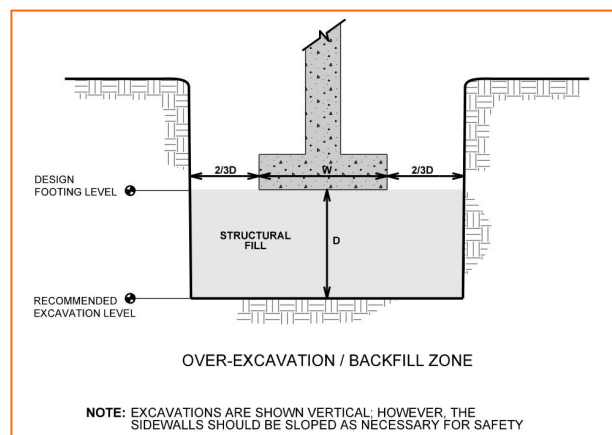
Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



Over-excavation for structural fill placement below footings should be conducted as shown below. The over-excavation should be backfilled up to the footing base elevation, with structural fill placed, as recommended in the **Earthwork** section.



SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil properties encountered at the site and as described on the exploration logs and results, it is our professional opinion that the **Seismic Site Classification is D**. Subsurface explorations at this site were extended to a maximum depth of 25 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Geophysical testing using MASW or ReMi methods may provide a more favorable seismic site classification.

FLOOR SLABS

We recommend that existing soils (native soils or existing fill) within 3 feet of finished floor elevation are overexcavated and replaced with engineered fill consisting of approved fill material. Design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure and positive drainage of the aggregate base beneath the floor slab.

Floor Slab Design Parameters

Item	Description
Floor slab support ¹	Aggregate base (see below) underlain by soil subgrade prepared according to Site Preparation .
Modulus of subgrade reaction ²	100 pounds per square inch per in (psi/in)
Aggregate base course	4 inches of NCDOT ABC

1. Floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed, and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course. The Geotechnical Engineer should approve the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

LATERAL EARTH PRESSURES

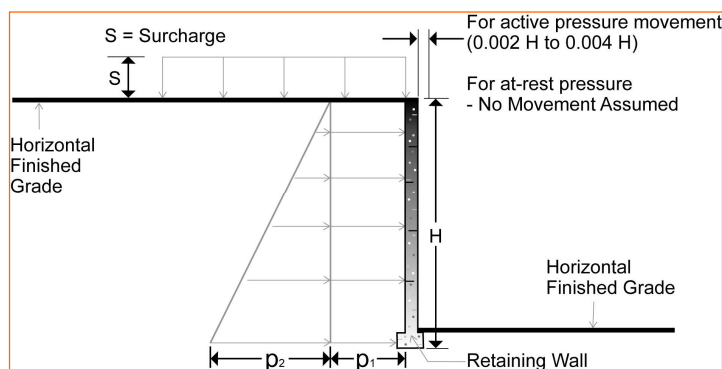
Design Parameters

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The “at-rest” condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).

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Lateral Earth Pressure Design Parameters				
Earth Pressure Condition ¹	Coefficient for Backfill Type ²	Surcharge Pressure ^{3, 4, 5} p_1 (psf)	Effective Fluid Pressures (psf) ^{2, 4, 5}	
			Unsaturated	Submerged
Active (K_a)	Granular - 0.31	(0.31)S	(40)H	(80)H
	Fine Grained - 0.41	(0.41)S	(50)H	(85)H
At-Rest (K_o)	Granular - 0.47	0.47)S	(55)H	(90)H
	Fine Grained - 0.58	(0.58)S	(70)H	(95)H
Passive (K_p)	Granular - 3.25	---	(390)H	(250)H
	Fine Grained - 2.46	---	(295)H	(205)H

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance.
2. Uniform, horizontal backfill, compacted to at least 95% of the ASTM D 698 maximum dry density, rendering a maximum unit weight of 120 pcf.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. No safety factor is included in these values.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively.

Preliminary Retaining Wall Considerations

See **Shallow Foundations** for preparation of below-grade structure or retaining wall subgrade if they are included in project sitework. If mechanically supported earth (MSE) walls or conventional cantilevered retaining walls are to be constructed, we recommend that these walls be designed with the cooperation of the project civil engineer and geotechnical engineer to:

- Identify conflicts from proposed foundations or utilities potentially impacting walls;

Geotechnical Engineering Report

Proposed Swift Elementary School ■ Raleigh, North Carolina

April 8, 2022 ■ Terracon Project No. 70215172



- Consider site constraints that might influence required construction activities such as excavation behind the wall;
- Consider need for interior drainage or waterproofing;
- Integrate site grading to direct surface water flow away from the wall;
- Identify additional subsurface exploration to determine foundation and retained soil conditions;
- Perform analyses of global stability and external wall stability;
- Recommend guidelines for retained soils to use in wall design;
- Evaluate structures to be located near or over the reinforced zone;
- Describe need for and type of fences at the top of the wall;
- Review possible contracting procedures for design and wall construction.

To provide effective coordination we recommend that the site civil engineer, geotechnical engineer, and owner meet to identify issues influencing retaining wall designs and identify responsible parties to reduce costs and minimize the chance of unexpected difficulties during both design and construction.

Native soils that may be excavated on-site are generally not acceptable for use as backfill against retaining walls or for use as backfill for mechanically stabilized earth walls. On-site materials, however, can be used as backfill for wall heights of less than 3 feet. With greater wall heights, clean granular material becomes the preferred choice due to both the reduction in lateral pressures and better drainage characteristics.

PAVEMENTS

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

Support characteristics of subgrade for pavement design do not account for shrink/swell movements of an expansive silt/clay subgrade, such as soils encountered on this project. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade. Due to noted occasional presence of high plastic soils (PI greater than 30), we recommend these soils to be overexcavated to a depth of 2 feet below finished pavement grade, where present, and replaced with structural fill. Sampling and testing of soil subgrade will be necessary to determine presence of high plastic soils. Lime treatment of pavement subgrade can be used as an alternative to overexcavation.

Pavement Design Parameters

Based on our experience with local subgrade preparation, a CBR of 3 was used for flexible pavement designs, and a modulus of subgrade reaction of 100 pci was used for the rigid pavement designs. A modulus of rupture of 600 psi was used for pavement concrete. When prepared as outlined in this report, the subsurface materials appear to be suitable for support of recommended pavement sections. Drainage conditions of pavement base may be poor during wet times of the year. Recommended pavement sections reflect potential poor drainage conditions.

Pavement thickness design is dependent upon:

- the anticipated traffic conditions during the life of the pavement;
- subgrade and paving material characteristics; and
- climatic conditions of the region.

The majority of the near surface soils consist of silt/clay soils. These soils are generally poor for pavement support since they are subject to softening and loss of strength with exposure to moisture. The use of geosynthetic material may be needed in some areas for subgrade separation or stabilization. Typical pavement sections for anticipated subgrade soil conditions are listed in the following table:

Pavement Type	Material	Light-Duty (inches)	Heavy-Duty (inches)
Flexible	Asphalt Concrete (NCDOT Type S9.5B)	3.0	1.0
	Asphalt Concrete (NCDOT Type I-19.0C)	-	3.0
	Crushed Stone (NCDOT ABC)	8	8
Rigid	Portland Cement Concrete (4000 psi)	5.0	6.0
	Crushed Aggregate Base Course (NCDOT ABC)	4.0	4.0

Light-duty pavements should be designated for car parking drives and lightly traveled service roads. Heavy-duty pavements should be designated for entrances and exits, driveways, areas in front of loading docks and dumpsters, and truck parking areas. For areas subject to concentrated and repetitive loading conditions, i.e. dumpster pads, we recommend using a Portland cement concrete pavement with a thickness of at least 7 inches underlain by at least 4 inches of aggregate base course.

Recommendations for pavement construction presented depend upon compliance with recommended material specifications. To assess compliance, observation and testing should be performed under the direction of the geotechnical engineer. Asphalt concrete aggregates and base course materials should conform to the North Carolina Department of Transportation (NCDOT) Mix Design Criteria found in Table 610-3 (updated December 6, 2017) of the *Standard Specifications for Roads and Structures*. Concrete pavement should be air-entrained and have a minimum compressive strength of 4,000 psi after 28 days of laboratory curing per ASTM C-31.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase, as needed.

Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Maintenance consists of both localized maintenance (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur, and repairs may be required.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%.
- Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage.
- Install below pavement drainage systems surrounding areas anticipated for frequent wetting.
- Install joint sealant and seal cracks immediately.
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
- Place compacted, low permeability backfill against the exterior side of curb and gutter.
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet)	Planned Location
6	25	A-1 to A-6, Former Mann Parcel, western portion of site
10	20	B-1 to B-10, Building Footprint
14	10	Pavement areas and site features

Boring Layout and Elevations: Unless otherwise noted, Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ± 10 feet). Surface elevations of test borings were interpolated from elevation contours of Wake County GIS maps.

Subsurface Exploration Procedures: We advanced test borings with track-mounted Diedrich D-50, Acker Renegade, and GeoProbe GP 3230 rotary drill rigs using continuous hollow stem augers. Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings after their completion. Pavements were patched with cold-mix asphalt and/or pre-mixed concrete, as appropriate.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below

Geotechnical Engineering Report

Proposed Swift Elementary School ■ Raleigh, North Carolina

April 8, 2022 ■ Terracon Project No. 70215172

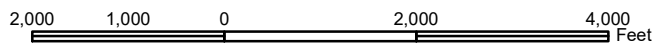
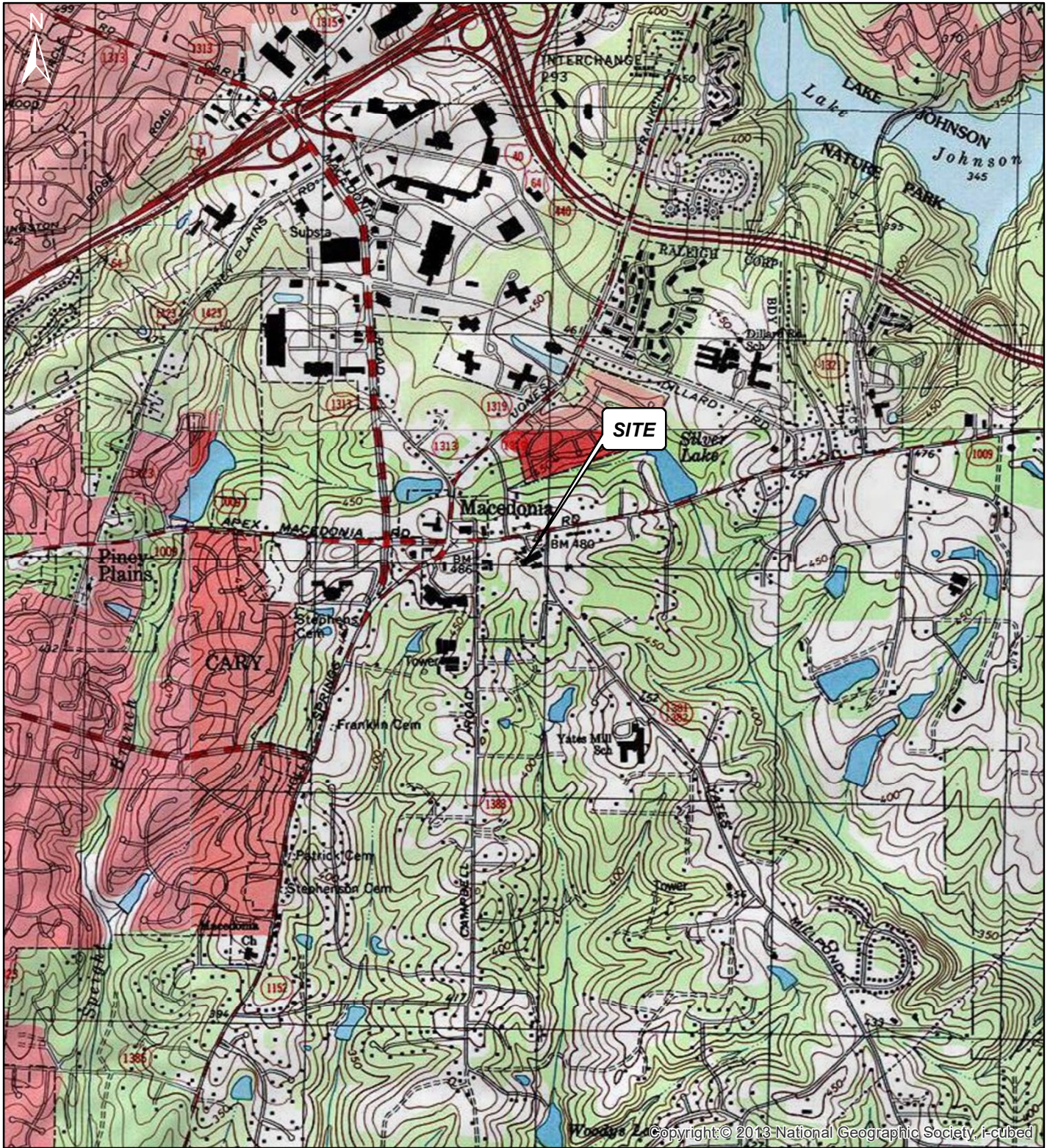


include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D422 Standard Test Method for Particle-Size Analysis of Soils

The laboratory testing program often included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE MAP AND EXPLORATION PLANS



PM:	MW
Drawn By:	MW
Checked By:	
Approved By:	
Project No.	70215172
Scale:	1 in = 2,000 ft
File Path:	
Date:	3/12/2022

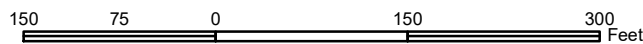
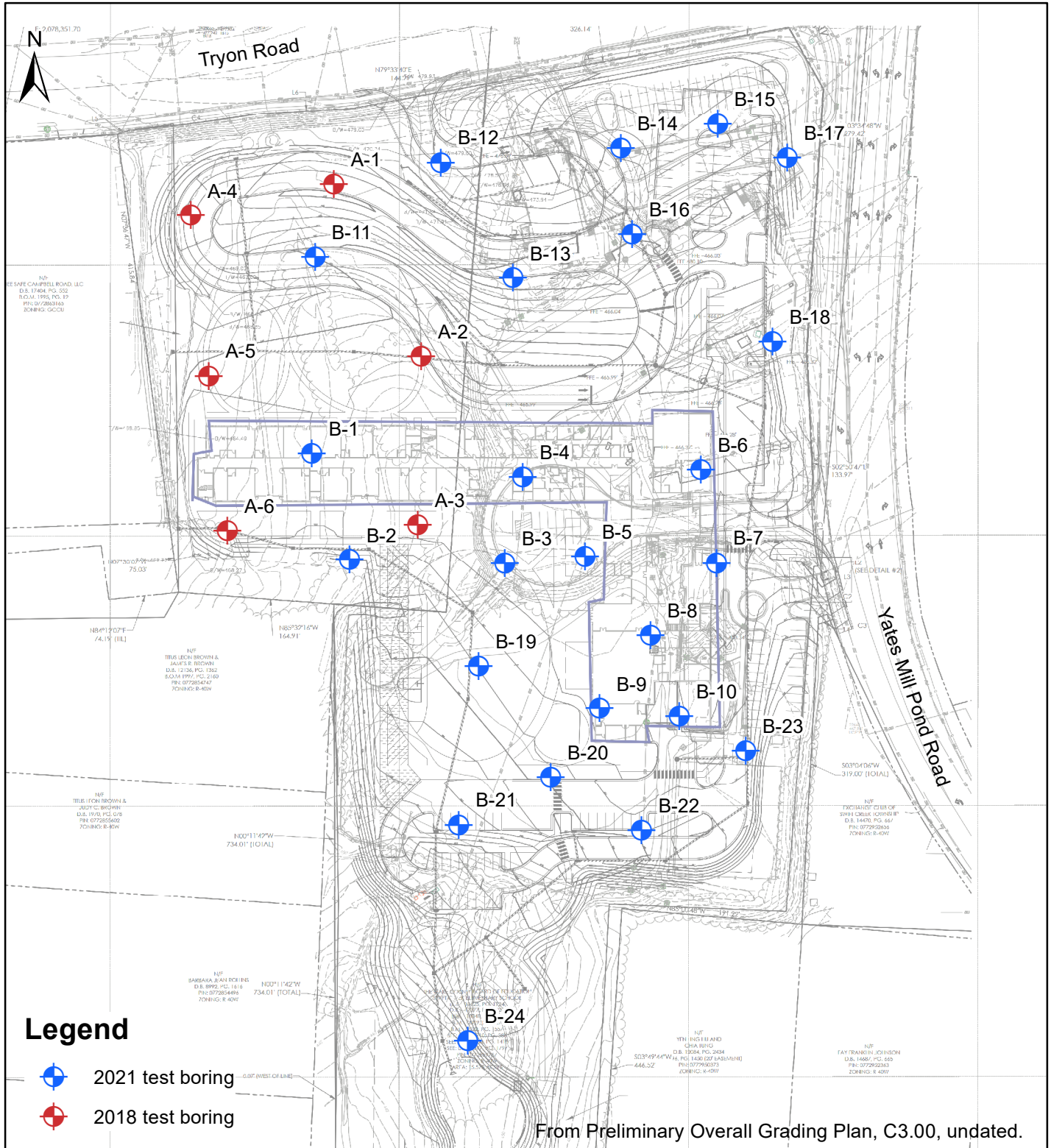
Terracon

2401 Brentwood Drive, Suite 107 Raleigh, NC 27604
 Phone: (919) 873-2211 Fax: (919) 873-9555

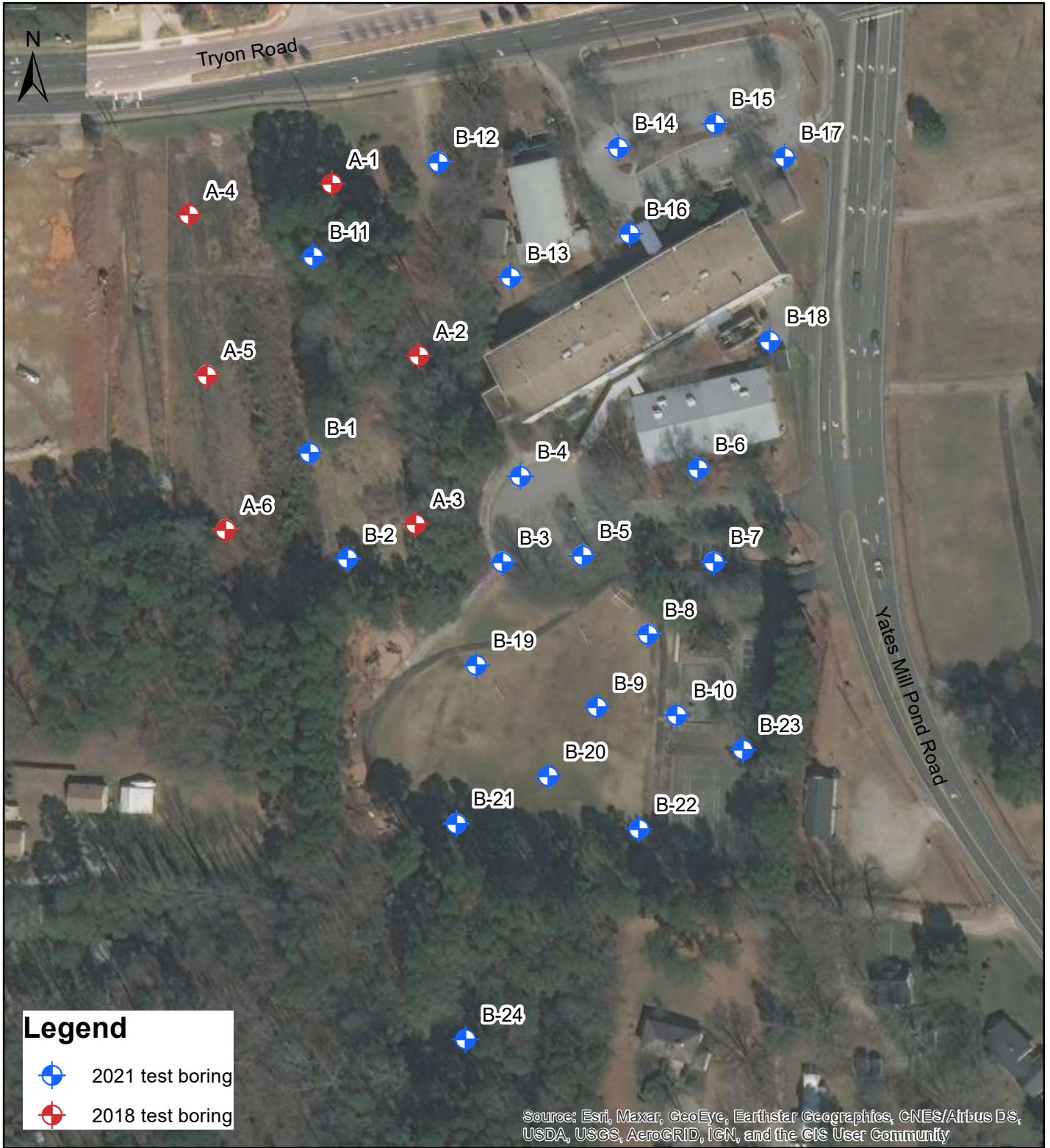
Site Map

**Swift Creek Elementary School
 Tryon Road & Yates Mill Pond Road, SWC
 Raleigh, North Carolina**

EXHIBIT NO.



PM:	MW	Project No:	70215172		Exploration Plan Swift Creek Elementary School Tryon Road & Yates Mill Pond Road, SWC Raleigh, North Carolina	EXHIBIT NO.
Drawn By:	MW	Scale:	1 in = 150 ft			
Checked By:		File Path:		2401 Brentwood Drive, Suite 107	Raleigh, NC 27604	
Approved By:		Date:	4/5/2022	Phone: (919) 873-2211	Fax: (919) 873-9555	



PM:	MW
Drawn By:	MW
Checked By:	
Approved By:	

Project No.	70215172
Scale:	1 in = 150 ft
File Path:	
Date:	4/5/2022

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Explore with us

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Phone: (919) 873-2211 Fax: (919) 873-9555

Exploration Plan Aerial

**Swift Creek Elementary School
Tryon Road & Yates Mill Pond Road, SWC
Raleigh, North Carolina**

EXHIBIT NO.

EXPLORATION RESULTS

Contents:

GeoModel Profiles

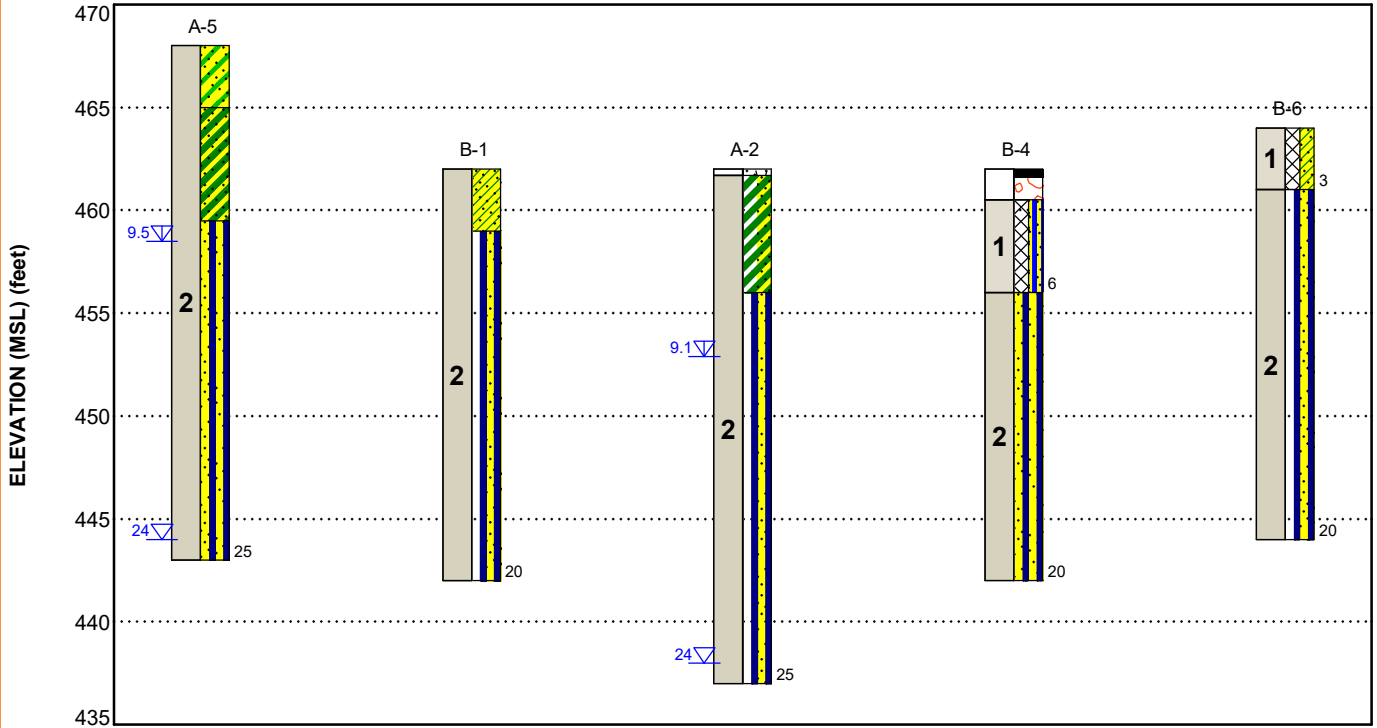
Boring Logs (A-1 to A-6 & B-1 to B-24)

Atterberg Limits Summary

Seasonal High Water Assessment Report

GEOMODEL

Swift Creek Elementary - Parcel 1 ■ Raleigh, NC
Terracon Project No. 70215172



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Existing Fill	Silty/Clayey Sand or Silt/Clay with variable plasticity and sand content.
2	Residual Soil	Silty/Clayey Sand or Silt/Clay with variable plasticity and sand content, micaceous, relict schist structure at lower depths. Occasional silty sand to sandy clay surficial layer.

LEGEND

- Topsoil
- Clayey Sand
- Sandy Lean Clay
- Sandy Silt
- Fat Clay with Sand
- Sandy Fat Clay
- Asphalt
- Elastic Silt with Sand
- Sandy Elastic Silt
- Aggregate Base Course

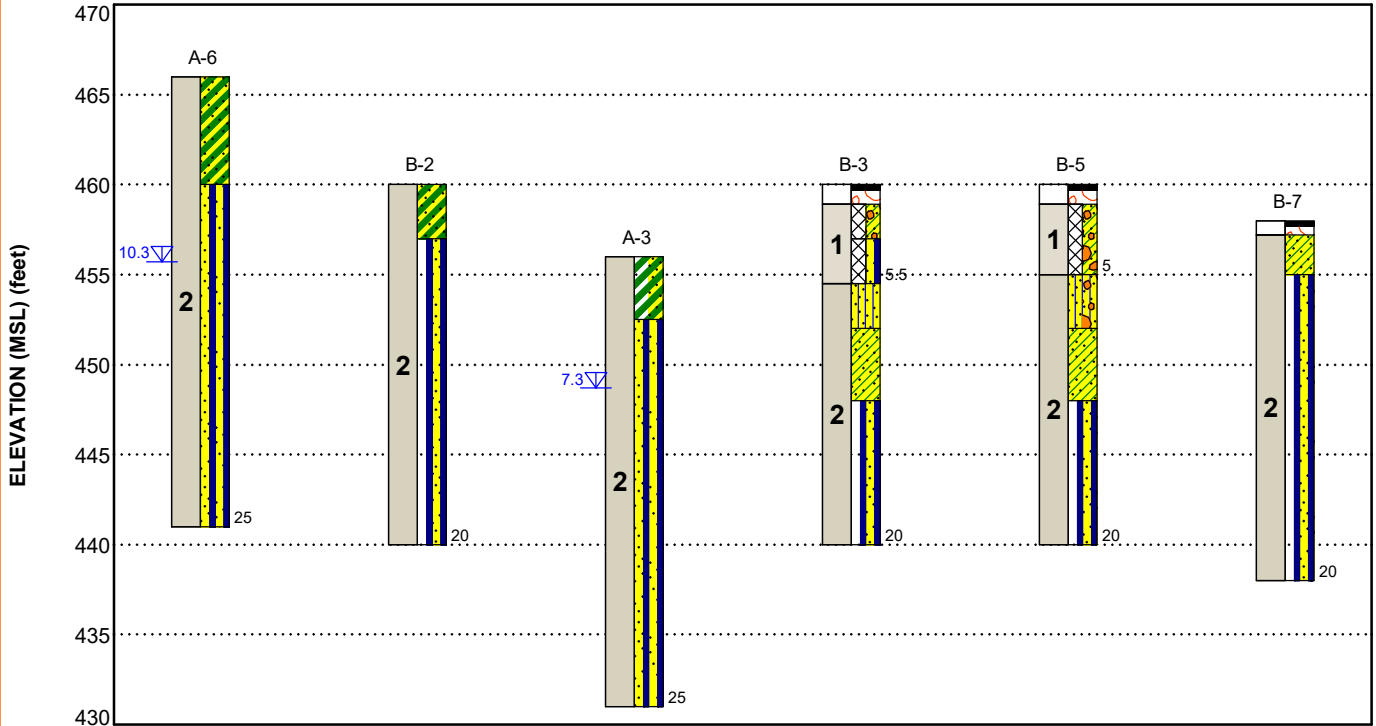
- First Water Observation
- Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

GEOMODEL

Swift Creek Elementary - Parcel 1 ■ Raleigh, NC
Terracon Project No. 70215172



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Existing Fill	Silty/Clayey Sand or Silt/Clay with variable plasticity and sand content.
2	Residual Soil	Silty/Clayey Sand or Silt/Clay with variable plasticity and sand content, micaceous, relict schist structure at lower depths. Occasional silty sand to sandy clay surficial layer.

LEGEND

- Fat Clay with Sand
- Elastic Silt with Sand
- Sandy Lean Clay with Gravel
- Silty Sand with Gravel
- Sandy Elastic Silt
- Asphalt
- Silty Sand
- Sandy Fat Clay
- Aggregate Base Course
- Sandy Lean Clay

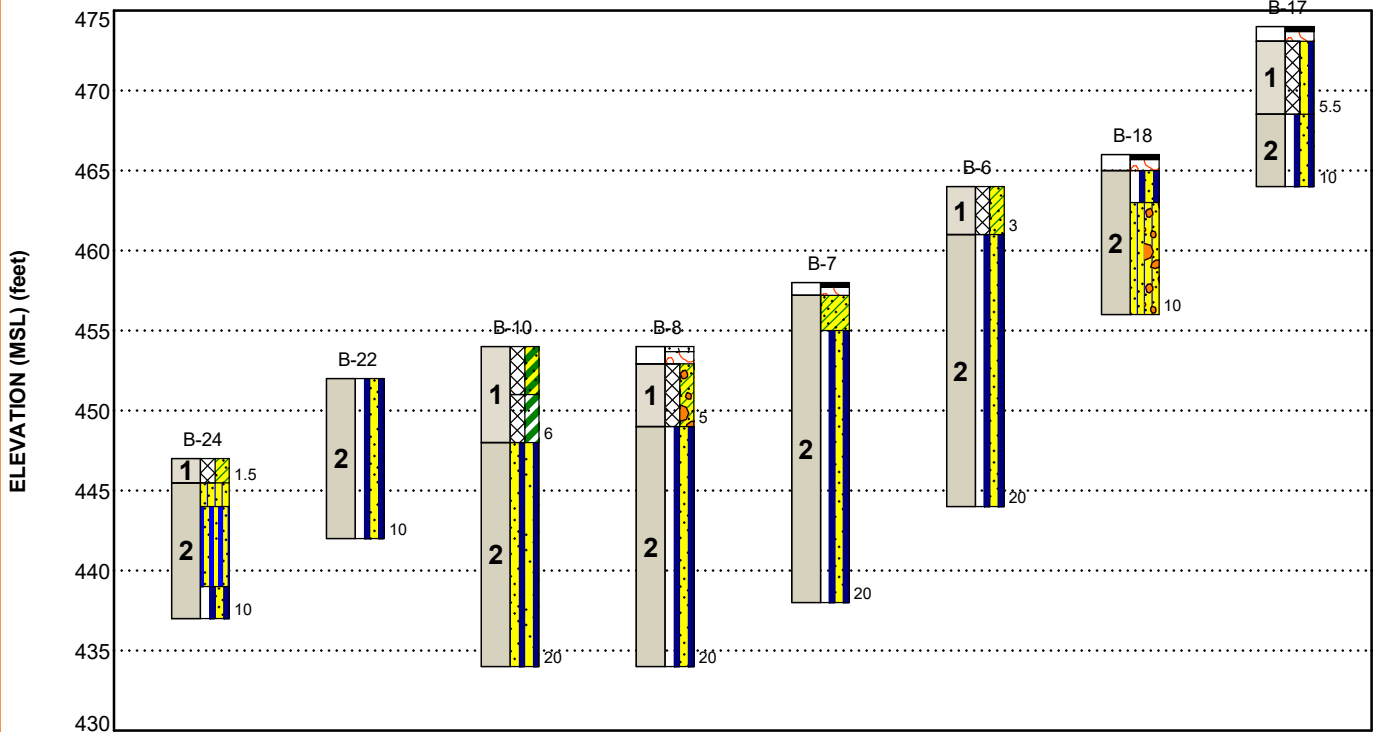
- First Water Observation
- Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

GEOMODEL

Swift Creek Elementary - Parcel 1 ■ Raleigh, NC
Terracon Project No. 70215172



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Existing Fill	Silty/Clayey Sand or Silt/Clay with variable plasticity and sand content.
2	Residual Soil	Silty/Clayey Sand or Silt/Clay with variable plasticity and sand content, micaceous, relict schist structure at lower depths. Occasional silty sand to sandy clay surficial layer.

LEGEND

- [Symbol] Sandy Lean Clay
- [Symbol] Aggregate Base Course
- [Symbol] Sandy Fat Clay
- [Symbol] Silty Sand with Gravel
- [Symbol] Elastic Silt with Sand
- [Symbol] Topsoil
- [Symbol] Fat Clay
- [Symbol] Silty Sand
- [Symbol] Asphalt
- [Symbol] Sandy Lean Clay with Gravel
- [Symbol] Sandy Elastic Silt
- [Symbol] Sandy Silt

- [Symbol] First Water Observation
- [Symbol] Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

BORING LOG NO. A-1

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
		See Exploration Plan Latitude: 35.7454° Longitude: -78.7348° Surface Elev.: 470 (Ft.) ELEVATION (Ft.)							LL-PL-PI	
		FAT CLAY WITH SAND (CH) , red brown and light brown, moist, stiff to very stiff, occasional quartz fragments, fine mica								
			12.0	458			3-5-6 N=11	27	70-28-42	71
							4-6-11 N=17	27		
							3-5-5 N=10	32		
							3-7-5 N=12			
					▽					
							3-3-5 N=8			
					⊗					
							2-3-3 N=6			
							3-4-5 N=9			
			25.0	445						
Boring Terminated at 25 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings after delayed water levels were measured.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

▽ 11.2' After 24 hours

⊗ Caved at 16.2 feet at 24 hours.



Boring Started: 09-25-2018

Boring Completed: 09-25-2018

Drill Rig: Acker Renegade

Driller: Duggins

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. A-2

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7449° Longitude: -78.7345° Surface Elev.: 462 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
								LL-PL-PI	PERCENT FINES
		TOPSOIL FAT CLAY WITH SAND (CH) , brown and red brown, moist, stiff, fine mica	0.3 461.5			4-4-7 N=11			
		ELASTIC SILT WITH SAND (MH) , maroon brown, red, and gray, moist, medium stiff to stiff, fine mica, relict schist structure	6.0 456			4-4-8 N=12			
			10.0 437	▽		3-4-4 N=8			
			11.0			2-3-4 N=7			
			15.0			2-3-5 N=8			
			20.0			5-4-6 N=10			
			25.0	▽		3-4-7 N=11			
Boring Terminated at 25 Feet			25.0						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings after delayed water levels were measured.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

- ▽ 24' After drilling
- ▽ 9.1' After 24 hours

☒ Caved at 9.3 feet at 24 hours.



Boring Started: 09-25-2018

Boring Completed: 09-25-2018

Drill Rig: Acker Renegade

Driller: Duggins

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. A-3

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
		See Exploration Plan Latitude: 35.7444° Longitude: -78.7345° Surface Elev.: 456 (Ft.)								LL-PL-PI	
		FAT CLAY WITH SAND (CH) , brown and red brown, moist, very stiff, fine mica	3.5	452.5				4-8-12 N=20	31		
		SANDY ELASTIC SILT (MH) , maroon red, tan, gray, and purple, moist, medium stiff to very stiff, fine mica, relict schist structure			5			4-7-11 N=18	26	67-33-34	63
						▽		2-3-6 N=9	34		
					10			4-3-4 N=7			
					15			2-3-4 N=7			
					20			2-3-4 N=7			
					25			3-4-5 N=9			
Boring Terminated at 25 Feet				431							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings after delayed water levels were measured.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

▽ 7.3' After 24 hours

⊠ Caved at 12.9 feet at 24 hours.



Boring Started: 09-25-2018

Boring Completed: 09-25-2018

Drill Rig: Acker Renegade

Driller: Duggins

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. A-4

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
		See Exploration Plan Latitude: 35.7453° Longitude: -78.7353° Surface Elev.: 472 (Ft.) ELEVATION (Ft.)						LL-PL-PI	
		DEPTH							
		0.3	471.5						
		TOPSOIL							
		FAT CLAY WITH SAND (CH) , tan and red-brown, moist, stiff, fine mica			X	3-4-5 N=9			
					X	3-6-7 N=13			
		6.0	466						
		SANDY ELASTIC SILT (MH) , purple, gray, orange, and maroon brown, moist, medium stiff to stiff, fine mica, relict schist structure			X	3-4-5 N=9			
					X	2-3-4 N=7			
				▽					
					X	2-2-3 N=5			
					X	2-2-4 N=6			
					X	3-4-7 N=11			
		25.0	447						
Boring Terminated at 25 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings after delayed water levels were measured.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

▽ 10.7' After 24 hours

⊠ Caved at 10.9 feet at 24 hours.



Boring Started: 09-25-2018

Boring Completed: 09-25-2018

Drill Rig: Acker Renegade

Driller: Duggins

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. A-5

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7448° Longitude: -78.7352° Surface Elev.: 468 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
								LL-PL-PI		
		CLAYEY SAND (SC) , tan, moist, medium dense								
			3.0		X	5-4-6 N=10	15			
		SANDY FAT CLAY (CH) , tan, moist, stiff, fine mica								
			5		X	5-6-9 N=15	27			
			8.5		X	3-4-6 N=10	28	61-24-37	56	
		SANDY ELASTIC SILT (MH) , light gray and red-brown, moist, stiff to very stiff, fine mica, relict schist structure, occasional quartz fragments		10	X	3-4-4 N=8				
			15		X	7-7-11 N=18				
			20		X	3-4-4 N=8				
			25.0		X	4-6-10 N=16				
Boring Terminated at 25 Feet			25							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings after delayed water levels were measured.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

▽ 24' After drilling
▽ 9.5' After 24 hours

☒ Caved at 12.3 feet at 24 hours.



Boring Started: 09-25-2018

Boring Completed: 09-25-2018

Drill Rig: Acker Renegade

Driller: Duggins

Project No.: 70215172

BORING LOG NO. A-6

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7444° Longitude: -78.7352° Surface Elev.: 466 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
								LL-PL-PI	PERCENT FINES
		SANDY FAT CLAY (CH) , red-brown, tan, and orange, moist, stiff to very stiff, fine mica	6.0			4-5-6 N=11			
		SANDY ELASTIC SILT (MH) , gray, tan, red-brown, and orange, moist, stiff, fine mica, relict schist structure	6.0			5-8-8 N=16			
			10.0	10.0		2-4-5 N=9			
			10.0			3-4-9 N=13			
			15.0			2-4-5 N=9			
			20.0			3-4-5 N=9			
			25.0			3-5-6 N=11			
Boring Terminated at 25 Feet			25.0						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings after delayed water levels were measured.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

10.3' After 24 hours

Caved at 10.5 feet at 24 hours.



Boring Started: 09-25-2018

Boring Completed: 09-25-2018

Drill Rig: Acker Renegade

Driller: Duggins

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. B-1

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
		See Exploration Plan Latitude: 35.7446° Longitude: -78.7349° Surface Elev.: 462 (Ft.)								LL-PL-PI	
		SANDY LEAN CLAY (CL) , fine to coarse grained, olive brown and red brown, moist, stiff	3.0	459				2-4-6 N=10	16	36-23-13	61
		ELASTIC SILT WITH SAND (MH) , fine to coarse grained, gray and rust brown to gray and purple gray, moist to very moist, stiff to very stiff, finely micaceous			5			6-8-12 N=20	26		
								2-5-6 N=11	32		
					10			3-4-5 N=9			
					15			2-4-4 N=8			
					20			3-4-5 N=9			
		Boring Terminated at 20 Feet		442	20						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 4.5'

2401 Brentwood Rd, Ste 107
Raleigh, NC

Boring Started: 12-22-2021

Boring Completed: 12-22-2021

Drill Rig: GP 3230

Driller: Duggins

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. B-2

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
		See Exploration Plan Latitude: 35.7443° Longitude: -78.7347° Surface Elev.: 460 (Ft.)								LL-PL-PI	
		SANDY FAT CLAY (CH) , fine to coarse grained, olive brown with red brown, moist, stiff, finely micaceous	3.0	457				1-4-6 N=10			
		ELASTIC SILT WITH SAND (MH) , fine to coarse grained, gray and rust brown to gray and purple gray, moist to very moist, stiff to very stiff, finely micaceous			5			5-8-12 N=20			
								2-5-7 N=12			
					10			3-4-7 N=11			
					15			2-5-5 N=10			
					20			2-3-5 N=8			
		Boring Terminated at 20 Feet			20						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 5'



Boring Started: 12-22-2021

Boring Completed: 12-22-2021

Drill Rig: GP 3230

Driller: Duggins

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. B-3

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7443° Longitude: -78.7342° Surface Elev.: 460 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
								LL-PL-PI		
	0.3	ASPHALT	459.5							
	1.1	AGGREGATE BASE COURSE	459							
1	3.0	FILL - SANDY LEAN CLAY WITH GRAVEL (CL) , fine to coarse grained, gray brown, moist, medium stiff	457		X	2-3-4 N=7				
	5.5	FILL - SANDY ELASTIC SILT (MH) , fine to coarse grained, gray and brown, moist, soft, micaceous	454.5	5	X	1-1-2 N=3				
	8.0	SILTY SAND (SM) , fine to medium grained, olive brown, moist, medium dense	452	10	X	4-5-6 N=11				
2	12.0	SANDY LEAN CLAY (CL) , fine to coarse grained, olive gray, moist, soft	448		X	1-1-2 N=3				
	20.0	ELASTIC SILT WITH SAND (MH) , fine to medium grained, gray and rust brown to purple and maroon gray, very moist, medium stiff, micaceous, relict schist structure	440	15	X	4-2-4 N=6				
	20.0	Boring Terminated at 20 Feet	440	20	X	2-3-4 N=7				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 13.8'



Boring Started: 12-21-2021

Boring Completed: 12-21-2021

Drill Rig: Diedrich D 50

Driller: Turnage

Project No.: 70215172

BORING LOG NO. B-4

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7445° Longitude: -78.7341° Surface Elev.: 462 (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
								LL-PL-PI	PERCENT FINES
		DEPTH 0.4 ASPHALT ELEVATION (Ft.) 461.5							
		1.5 AGGREGATE BASE COURSE 460.5							
1		FILL - SANDY SILT (ML) , fine to coarse grained, red brown and brown, moist, medium stiff				2-3-4 N=7	19	46-34-12	58
		6.0 456	5			2-3-4 N=7	21		
		SANDY ELASTIC SILT (MH) , fine to coarse grained, gray and brown to gray and purple brown, moist to very moist, medium stiff to stiff				5-5-5 N=10	26	71-42-29	62
		20.0 442	10			2-3-4 N=7	35		
2						2-5-4 N=9			
		Boring Terminated at 20 Feet	20			2-4-7 N=11			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 12'



Boring Started: 12-20-2021

Boring Completed: 12-20-2021

Drill Rig: Diedrich D 50

Driller: Turnage

Project No.: 70215172

BORING LOG NO. B-5

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7443° Longitude: -78.7339° Surface Elev.: 460 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
								LL-PL-PI		
	0.3	ASPHALT	459.5							
	1.1	AGGREGATE BASE COURSE	459							
1		FILL - SANDY LEAN CLAY WITH GRAVEL (CL) , fine to coarse grained, brown, moist, medium stiff			X	2-2-3 N=5				
	5.0	SILTY SAND WITH GRAVEL (SM) , fine to medium grained, brown, moist, medium dense	455		X	2-3-3 N=6				
	8.0	SANDY LEAN CLAY (CL) , fine to coarse grained, olive gray, moist, medium stiff	452		X	6-7-15 N=22				
2	12.0	ELASTIC SILT WITH SAND (MH) , fine to medium grained, light gray and tan to purple and maroon gray, very moist, medium stiff to stiff, micaceous, relict schist structure	448		X	2-3-4 N=7				
	20.0	Boring Terminated at 20 Feet	440		X	2-4-8 N=12				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 10.8'

2401 Brentwood Rd, Ste 107
Raleigh, NC

Boring Started: 12-21-2021

Boring Completed: 12-21-2021

Drill Rig: Diedrich D 50

Driller: Turnage

Project No.: 70215172

BORING LOG NO. B-6

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7446° Longitude: -78.7335° Surface Elev.: 464 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
								LL-PL-PI		
1		FILL - SANDY LEAN CLAY (CL) , fine to coarse grained, olive brown and red brown, moist, stiff, silty sand zones	3.0		X	5-8-7 N=15				
2		ELASTIC SILT WITH SAND (MH) , fine to coarse grained, olive brown and red brown to gray and purple brown, moist to very moist, stiff, occasional gravel	461		X	4-6-9 N=15				
					X	3-5-5 N=10				
					X	2-4-6 N=10				
				X						
					X	3-3-5 N=8				
					X	2-5-5 N=10				
		Boring Terminated at 20 Feet	20.0							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 12'



Boring Started: 12-20-2021

Boring Completed: 12-20-2021

Drill Rig: Diedrich D 50

Driller: Turnage

Project No.: 70215172

BORING LOG NO. B-7

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7443° Longitude: -78.7334° Surface Elev.: 458 (Ft.)	DEPTH (Ft.)	ELEVATION (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
									LL-PL-PI	PERCENT FINES
			0.3	457.5						
		ASPHALT	0.8	457						
		AGGREGATE BASE COURSE								
		SANDY LEAN CLAY (CL) , fine to medium grained, tan brown, moist, medium stiff	3.0	455		X	2-3-4 N=7			
		ELASTIC SILT WITH SAND (MH) , fine to medium grained, gray and tan to purple and maroon gray, very moist, medium stiff to stiff, micaceous, relict schist structure				X	2-3-4 N=7			
						X	1-3-4 N=7			
						X	2-3-5 N=8			
						X	2-3-4 N=7			
						X	2-4-5 N=9			
		Boring Terminated at 20 Feet	20.0	438						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

<p>Advancement Method: HSA</p> <p>Abandonment Method: Boring backfilled with soil cuttings upon completion.</p>	<p>See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).</p> <p>See Supporting Information for explanation of symbols and abbreviations.</p> <p>Elevations were interpolated from a topographic site plan.</p>	<p>Notes:</p>						
<p>WATER LEVEL OBSERVATIONS</p> <p><i>No free water observed</i></p>	<p>2401 Brentwood Rd, Ste 107 Raleigh, NC</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Boring Started: 12-21-2021</td> <td style="width: 50%;">Boring Completed: 12-21-2021</td> </tr> <tr> <td>Drill Rig: Diedrich D 50</td> <td>Driller: Turnage</td> </tr> <tr> <td colspan="2">Project No.: 70215172</td> </tr> </table>	Boring Started: 12-21-2021	Boring Completed: 12-21-2021	Drill Rig: Diedrich D 50	Driller: Turnage	Project No.: 70215172	
Boring Started: 12-21-2021	Boring Completed: 12-21-2021							
Drill Rig: Diedrich D 50	Driller: Turnage							
Project No.: 70215172								
<p> cave at 12.7'</p>								

BORING LOG NO. B-8

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7441° Longitude: -78.7337° Surface Elev.: 454 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
								LL-PL-PI		
		DEPTH								
		0.3 TOPSOIL 453.5								
		1.1 AGGREGATE BASE COURSE 453								
1		FILL - SANDY LEAN CLAY WITH GRAVEL (CL) , fine to coarse grained, brown, moist, soft to medium stiff				2-2-2 N=4				
		5.0				3-2-1 N=3				
		ELASTIC SILT WITH SAND (MH) , fine to medium grained, light gray and tan to purple and maroon gray, very moist, soft to stiff, micaceous, relict schist structure				1-1-2 N=3				
						2-3-3 N=6				
2						2-3-4 N=7				
						2-5-6 N=11				
		20.0 Boring Terminated at 20 Feet 434	20							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 13.5'



Boring Started: 12-21-2021

Boring Completed: 12-21-2021

Drill Rig: Diedrich D 50

Driller: Turnage

Project No.: 70215172

BORING LOG NO. B-9

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7439° Longitude: -78.7338° Surface Elev.: 454 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
								LL-PL-PI		
1		FILL - SANDY FAT CLAY (CH) , fine to coarse grained, olive gray and brown, moist, soft to medium stiff	7.0		X	1-3-5 N=8				
					X	2-3-4 N=7				
					X	1-1-1 N=2				
2		SANDY ELASTIC SILT (MH) , fine to coarse grained, light gray to purple gray, very moist, soft to medium stiff	20.0		X	0-1-1 N=2				
					X	1-2-3 N=5				
					X	1-2-3 N=5				
		Boring Terminated at 20 Feet	20.0							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method: HSA	See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations. Elevations were interpolated from a topographic site plan.	Notes:
Abandonment Method: Boring backfilled with soil cuttings upon completion.		
WATER LEVEL OBSERVATIONS <i>No free water observed</i>	 2401 Brentwood Rd, Ste 107 Raleigh, NC	Boring Started: 12-22-2021 Boring Completed: 12-22-2021 Drill Rig: GP 3230 Driller: Duggins Project No.: 70215172
cave at 6'		

BORING LOG NO. B-10

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7438° Longitude: -78.7336°	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
										LL-PL-PI		
1			3.0	451				1-1-2 N=3				
			6.0	448	5			1-2-2 N=4				
2								1-2-4 N=6				
					10			1-1-3 N=4				
					15			1-2-4 N=6				
			20.0	434	20			1-3-3 N=6				
			Boring Terminated at 20 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 5'



2401 Brentwood Rd, Ste 107
Raleigh, NC

Boring Started: 12-22-2021

Boring Completed: 12-22-2021

Drill Rig: GP 3230

Driller: Duggins

Project No.: 70215172

BORING LOG NO. B-11

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
		See Exploration Plan Latitude: 35.7452° Longitude: -78.7349° Surface Elev.: 464 (Ft.) ELEVATION (Ft.)						LL-PL-PI	
2		<p>SANDY ELASTIC SILT (MH), fine to coarse grained, olive brown and rust brown to gray and rust brown, very moist, stiff to very stiff</p>	<p>10.0</p>	<p>454</p>	<p>10</p>	<p>1-3-6 N=9</p> <p>5-11-11 N=22</p> <p>2-4-6 N=10</p> <p>1-4-7 N=11</p>	<p>27</p> <p>25</p>	<p>56-35-21</p>	<p>65</p>
		Boring Terminated at 10 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS
No free water observed



Boring Started: 12-22-2021

Boring Completed: 12-22-2021

Drill Rig: GP 3230

Driller: Duggins

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

cave at 2'

BORING LOG NO. B-12

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION <small>See Exploration Plan</small> Latitude: 35.7455° Longitude: -78.7344° Surface Elev.: 471 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
								LL-PL-PI	PERCENT FINES
2		<p>SANDY ELASTIC SILT (MH), fine to coarse grained, brown and rust brown to purple brown, very moist, medium stiff to stiff</p>	10.0	461	10	<p>1-2-2 N=4</p> <p>1-4-4 N=8</p> <p>1-4-7 N=11</p> <p>2-3-4 N=7</p>			
		Boring Terminated at 10 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS
No free water observed



Boring Started: 12-22-2021

Boring Completed: 12-22-2021

Drill Rig: GP 3230

Driller: Duggins

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

cave at 2.5'

BORING LOG NO. B-13

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES				
		See Exploration Plan Latitude: 35.7451° Longitude: -78.7341° Surface Elev.: 468 (Ft.) ELEVATION (Ft.)						LL-PL-PI					
2		<p>SANDY ELASTIC SILT (MH), fine to coarse grained, brown and rust brown to purple gray, very moist, medium stiff to stiff</p>	10.0	458	10	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">1-2-4 N=6</td> </tr> <tr> <td style="text-align: center;">3-5-6 N=11</td> </tr> <tr> <td style="text-align: center;">2-4-4 N=8</td> </tr> <tr> <td style="text-align: center;">1-3-5 N=8</td> </tr> </table>	1-2-4 N=6	3-5-6 N=11	2-4-4 N=8	1-3-5 N=8			
1-2-4 N=6													
3-5-6 N=11													
2-4-4 N=8													
1-3-5 N=8													
		Boring Terminated at 10 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS
No free water observed

2401 Brentwood Rd, Ste 107
Raleigh, NC

Boring Started: 12-22-2021
Drill Rig: GP 3230
Project No.: 70215172

Boring Completed: 12-22-2021
Driller: Duggins

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. B-14

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7455° Longitude: -78.7338° Surface Elev.: 474 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
								LL-PL-PI	PERCENT FINES
		DEPTH							
	0.3	ASPHALT	473.5						
	0.9	AGGREGATE BASE COURSE	473						
2	10.0	ELASTIC SILT WITH SAND (MH) , fine to coarse grained, red brown and brown to gray and purple brown, moist, stiff	464	5	X	3-4-4 N=8	29	51-43-8	77
				5	X	2-4-5 N=9	27		
				5	X	3-3-5 N=8	27		
				10	X	3-5-5 N=10			
		Boring Terminated at 10 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 5'



Boring Started: 12-21-2021

Boring Completed: 12-21-2021

Drill Rig: Diedrich D 50

Driller: Turnage

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. B-15

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
		See Exploration Plan Latitude: 35.7456° Longitude: -78.7334° Surface Elev.: 474 (Ft.)						LL-PL-PI	
		DEPTH							
	0.3	ASPHALT	473.5						
	0.9	AGGREGATE BASE COURSE	473						
	5.5	FAT CLAY WITH SAND (CH) , fine to coarse grained, red brown and brown, moist, stiff	468.5	5	X	4-5-7 N=12			
	10.0	ELASTIC SILT WITH SAND (MH) , fine to coarse grained, red brown and brown to gray and purple brown, moist to very moist, stiff	464	5	X	3-5-7 N=12			
				10	X	3-5-6 N=11			
					X	3-4-5 N=9			
		Boring Terminated at 10 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 5'



Boring Started: 12-20-2021

Boring Completed: 12-20-2021

Drill Rig: Diedrich D 50

Driller: Turnage

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. B-16

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7452° Longitude: -78.7337° Surface Elev.: 474 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
								LL-PL-PI	PERCENT FINES
	0.3 0.8	ASPHALT	473.5 473						
	0.8	AGGREGATE BASE COURSE	473						
	2	FAT CLAY WITH SAND (CH) , fine to coarse grained, red brown, moist, medium stiff	5	5	X	2-2-3 N=5			
	7.5		466.5		X	1-1-4 N=5			
	7.5	ELASTIC SILT WITH SAND (MH) , fine to coarse grained, gray and purple brown, moist, stiff	10		X	2-2-3 N=5			
	10.0	Boring Terminated at 10 Feet	464		X	2-5-7 N=12			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 5'



2401 Brentwood Rd, Ste 107
Raleigh, NC

Boring Started: 12-20-2021

Boring Completed: 12-20-2021

Drill Rig: Diedrich D 50

Driller: Turnage

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. B-17

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7455° Longitude: -78.7332° Surface Elev.: 474 (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
								LL-PL-PI	PERCENT FINES
		ELEVATION (Ft.)							
	0.3 0.9	ASPHALT AGGREGATE BASE COURSE	473.5 473						
1	5.5	FILL - SANDY ELASTIC SILT (MH) , fine to coarse grained, brown, moist, soft to medium stiff	468.5	5	X	3-3-3 N=6			
2	10.0	ELASTIC SILT WITH SAND (MH) , fine to coarse grained, gray and purple brown, moist, soft to medium stiff	464	10	X	1-1-1 N=2			
		Boring Terminated at 10 Feet				1-1-2 N=3			
						2-2-3 N=5			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 5'



Boring Started: 12-20-2021

Boring Completed: 12-20-2021

Drill Rig: Diedrich D 50

Driller: Turnage

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. B-18

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7449° Longitude: -78.7332° Surface Elev.: 466 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
								LL-PL-PI	PERCENT FINES
	0.3	ASPHALT	465.5						
	1.0	AGGREGATE BASE COURSE	465						
	3.0	ELASTIC SILT WITH SAND (MH) , fine to coarse grained, gray and purple brown, moist to very moist, medium stiff	463		X	2-3-3 N=6	34		
	10.0	SILTY SAND WITH GRAVEL (SM) , fine to coarse grained, purple brown, very moist, loose	456		X	1-3-3 N=6	36	NP	33
			5		X	2-2-3 N=5	39		
			10		X	1-2-4 N=6			
		Boring Terminated at 10 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 5'



Boring Started: 12-20-2021

Boring Completed: 12-20-2021

Drill Rig: Diedrich D 50

Driller: Turnage

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. B-19

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
		See Exploration Plan Latitude: 35.744° Longitude: -78.7343° Surface Elev.: 454 (Ft.) ELEVATION (Ft.)							LL-PL-PI	
2		SILT WITH SAND (ML) , fine to coarse grained, red brown and brown, moist, stiff	5.5			X	3-3-10 N=13	28	44-27-17	70
				5		X	4-4-6 N=10	24		
		ELASTIC SILT WITH SAND (MH) , fine to coarse grained, gray and rust brown, moist, stiff				X	2-6-7 N=13			
			10.0			X	3-4-4 N=8			
		Boring Terminated at 10 Feet		10						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 5'



Boring Started: 12-22-2021

Boring Completed: 12-22-2021

Drill Rig: GP 3230

Driller: Duggins

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. B-20

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES				
		See Exploration Plan						Surface Elev.: 453 (Ft.) ELEVATION (Ft.)		LL-PL-PI			
		Latitude: 35.7437° Longitude: -78.734°											
		DEPTH											
2		ELASTIC SILT WITH SAND (MH) , fine to coarse grained, gray and rust brown to gray and purple brown, moist, medium stiff to stiff	10.0	443	10	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">2-4-4 N=8</td> </tr> <tr> <td style="text-align: center;">3-2-3 N=5</td> </tr> <tr> <td style="text-align: center;">1-2-3 N=5</td> </tr> <tr> <td style="text-align: center;">2-2-3 N=5</td> </tr> </table>	2-4-4 N=8	3-2-3 N=5	1-2-3 N=5	2-2-3 N=5			
2-4-4 N=8													
3-2-3 N=5													
1-2-3 N=5													
2-2-3 N=5													
		Boring Terminated at 10 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 2.5'



Boring Started: 12-22-2021

Boring Completed: 12-22-2021

Drill Rig: GP 3230

Driller: Duggins

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. B-21

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7435° Longitude: -78.7344° Surface Elev.: 451 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
								LL-PL-PI		
1		DEPTH 1.5	449.5			1-2-3 N=5				
		FILL - FAT CLAY WITH SAND (CH) , fine to coarse grained, dark gray, moist, medium stiff								
2		DEPTH 4.5	446.5			1-2-3 N=5				
		FILL - FAT CLAY WITH SAND (CH) , fine to coarse grained, brown and rust brown to olive brown and rust brown, moist, medium stiff								
		DEPTH 10.0	441			1-2-3 N=5				
		ELASTIC SILT WITH SAND (MH) , fine to coarse grained, olive brown and rust brown to olive gray and light gray, very moist, medium stiff								
Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 2.5'



Boring Started: 12-22-2021

Boring Completed: 12-22-2021

Drill Rig: GP 3230

Driller: Duggins

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. B-22

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
		See Exploration Plan Latitude: 35.7435° Longitude: -78.7344° Surface Elev.: 452 (Ft.) ELEVATION (Ft.)						LL-PL-PI	
2		ELASTIC SILT WITH SAND (MH) , fine to coarse grained, purple gray, moist, medium stiff	10.0			1-1-3 N=4			
			5			1-3-3 N=6			
						1-1-3 N=4			
						2-3-4 N=7			
		Boring Terminated at 10 Feet	10						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed

cave at 43'



Boring Started: 12-22-2021

Boring Completed: 12-22-2021

Drill Rig: GP 3230

Driller: Duggins

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

BORING LOG NO. B-23

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

MODEL LAYER	GRAPHIC LOG	LOCATION	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
		See Exploration Plan Latitude: 35.7437° Longitude: -78.7333° Surface Elev.: 456 (Ft.) ELEVATION (Ft.)							LL-PL-PI	
2		ELASTIC SILT WITH SAND (MH) , fine to coarse grained, gray and rust brown, very moist, soft to stiff	10.0	10						
		Boring Terminated at 10 Feet		10						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS
No free water observed



Boring Started: 12-22-2021

Boring Completed: 12-22-2021

Drill Rig: GP 3230

Driller: Duggins

Project No.: 70215172

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

cave at 7'

BORING LOG NO. B-24

PROJECT: Swift Creek Elementary - Parcel 1

CLIENT: Wake County Public School System
Cary, NC

SITE: 5601 Tryon Road
Raleigh, NC

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_70215172 SWIFT CREEK ELEME.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.7429° Longitude: -78.7343° Surface Elev.: 447 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
								LL-PL-PI		
1		FILL - SANDY LEAN CLAY (CL) , fine to coarse grained, dark gray, moist, soft 1.5 445.5								
2		SILTY SAND (SM) , fine to coarse grained, olive brown, moist, medium dense 3.0 444		X		1-7-11 N=18	11			
		SANDY SILT (ML) , fine to coarse grained, gray and rust brown, moist, stiff to very stiff 5 439		X		6-10-12 N=22	17	39-27-12	58	
		ELASTIC SILT WITH SAND (MH) , fine to coarse grained, gray and rust brown, moist, medium stiff 8.0 437		X		4-6-7 N=13				
		Boring Terminated at 10 Feet 10.0 437		X		2-3-4 N=7				

Stratification lines are approximate. In-situ, the transition may be gradual.

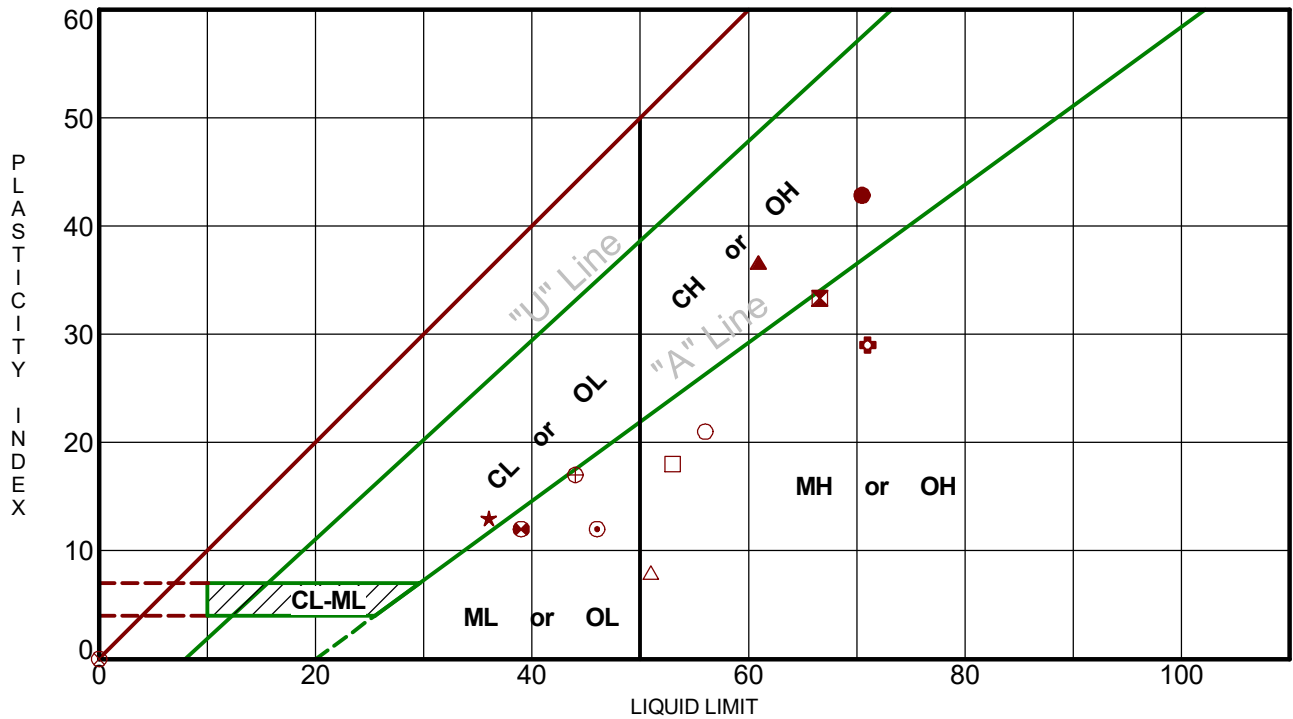
Hammer Type: Automatic

Advancement Method: HSA	See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any). See Supporting Information for explanation of symbols and abbreviations. Elevations were interpolated from a topographic site plan.	Notes:
Abandonment Method: Boring backfilled with soil cuttings upon completion.		
WATER LEVEL OBSERVATIONS <i>No free water observed</i>	2401 Brentwood Rd, Ste 107 Raleigh, NC	Boring Started: 12-22-2021 Drill Rig: GP 3230 Project No.: 70215172
		Boring Completed: 12-22-2021 Driller: Duggins

cave at 2'

ATTERBERG LIMITS RESULTS

ASTM D4318



LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS 70215172 SWIFT CREEK ELEMENTARY.GPJ TERRACON_DATATEMPLATE.GDT 2/10/22

Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
● A-1	1 - 2.5	70	28	42	71.2	CH	FAT CLAY with SAND
⊠ A-3	3.5 - 5	67	33	34	63.2	MH	SANDY ELASTIC SILT
▲ A-5	6 - 7.5	61	24	37	56.1	CH	SANDY FAT CLAY
★ B-1	1 - 2.5	36	23	13	60.6	CL	SANDY LEAN CLAY
⊙ B-4	1 - 2.5	46	34	12	58.2	ML	SANDY SILT
⊕ B-4	6 - 7.5	71	42	29	62.2	MH	SANDY ELASTIC SILT
○ B-11	1 - 2.5	56	35	21	64.8	MH	SANDY ELASTIC SILT
△ B-14	1 - 2.5	51	43	8	76.9	MH	ELASTIC SILT with SAND
⊗ B-18	3.5 - 5	NP	NP	NP	32.8	SM	SILTY SAND
⊕ B-19	1 - 2.5	44	27	17	70.4	ML	SILT with SAND
□ B-23	1 - 2.5	53	35	18	83.4	MH	ELASTIC SILT with SAND
⊕ B-24	3.5 - 5	39	27	12	58.0	ML	SANDY SILT

PROJECT: Swift Creek Elementary - Parcel 1

SITE: 5601 Tryon Road
Raleigh, NC



PROJECT NUMBER: 70215172

CLIENT: Wake County Public School System
Cary, NC



Agri-Waste Technology, Inc.
501 North Salem Street, Suite 203
Apex, NC 27502
919-859-0669
www.agriwaste.com



**Seasonal High-Water Table (SHWT) Assessments
Terracon Project: Swift Creek Elementary School
Yates Mill Pond Road
Raleigh, NC (Wake County)**

PREPARED FOR: Mr. Seth Bowman, Staff Engineer
Terracon

PREPARED BY: Jeff Vaughan
Senior Agronomist/Soil Scientist

DATE: December 16, 2021

Seasonal High-Water Table (SHWT) assessments were conducted at the subject property on December 16, 2021. Jeff Vaughan and Alex Thompson of Agri-Waste Technology, Inc. (AWT) conducted the evaluation. A property reference site plan, as provided by Seth Bowman w/Terracon, is in Attachment 1 to this report. Reference surface elevations at each assessment location were provided by Terracon and not field verified by AWT. Three separate SHWT locations were evaluated on the property. Copies of the boring log notes are included in Attachment 2.

The predominant soil types mapped within this area are Appling gravelly sandy loam (map symbol AgB2) and Mantachie soils (map symbol Ma) (Attachment 1). Soils on this site are not native, but have been disturbed by human activities. Soil borings were advanced until a restrictive horizon (auger refusal) was encountered.

Indications of a perched seasonal high-water table were observed at a depth of 10 inches and 38 inches for soil borings A1 and A2, respectively, below the existing ground surface (B.G.S.) and were present throughout the soil profile once first encountered. Soils typically perch water during winter periods when evapotranspiration is limited, soil moisture remains high, and temperatures are low. An apparent (visible) water table was observed at a depth of 20" for soil boring A3 (water was seen in the soil boring hole) below the soil surface during AWT's evaluation. See summary table below.

Boring	Surface Elevation (ft.)	SHWT Indicators (inches B.G.S.)	Elevation of SHWT Indicators (ft.)	Total Boring Depth (ft.)
A1	466	10	465.17	464.17
A2	456	38	452.83	450.50
A3	457	20	455.33	455.33

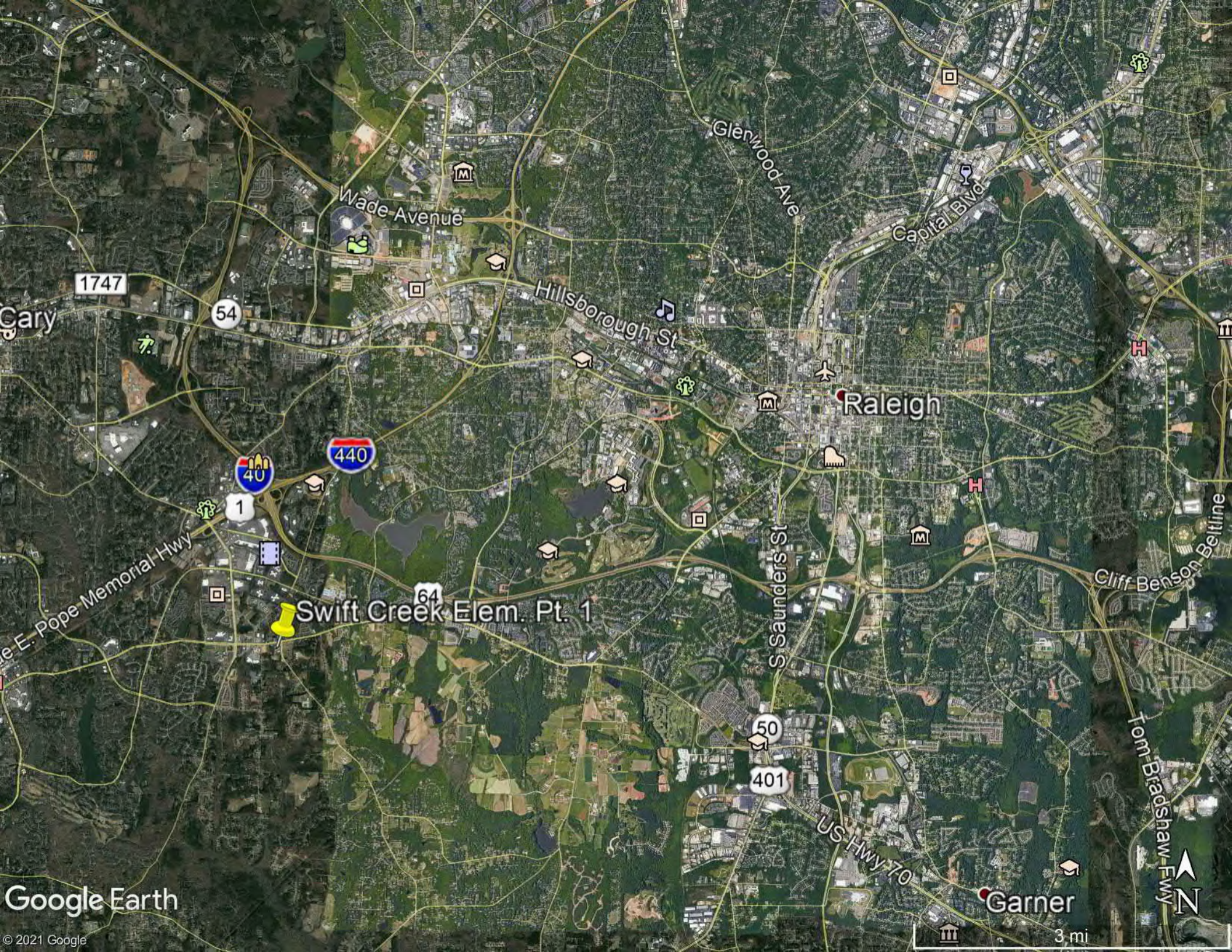
We appreciate the opportunity to assist you in this matter. Please contact us with any questions, concerns, or comments.

Sincerely,



Jeff Vaughan

ATTACHMENT 1: Reference Site Plan



1747

54

40

440

1

64

Swift Creek Elem. Pt. 1

50

401

US Hwy 70

Gary

Wade Avenue

Hillsborough St

Glenwood Ave

Capital Blvd

Raleigh

S Saunders St

Cliff-Benson Beltline

Tom Bradsshaw Fwy

Garner

Google Earth

© 2021 Google

3 mi





Tryon Rd

Yates Mill Pond Rd

1382

A-1

A-2

A-3



ATTACHMENT 2: Soil Boring Logs

Comments: Fill soil, disturbed by human activities. SHWT indications at 20" deep.

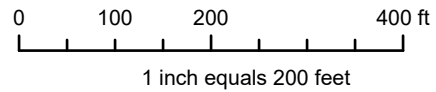
EVALUATED BY: Jeff Vaughan and Alex Thompson
 COMMENTS: _____

LEGEND OF ABBREVIATIONS FOR SITE EVALUATION FORM

<u>LANDSCAPE POSITION</u>	<u>TEXTURE GROUP</u>	<u>TEXTURE CLASS</u>	<u>.1955 LTAR</u> (gal/day/sqft)
CC - Concave Slope CV - Convex Slope DS - Debris Slump D - Depression DW - Drainage Way FP - Flood Plain FS - Foot Slope H - Head Slope I - Interflueve L - Linear Slope N - Nose Slope P - Pocosin R - Ridge S - Shoulder T - Terrace	I II III IV	S - Sand LS - Loamy Sand SL - Sandy Loam L - Loam SCL - Sandy Clay Loam CL - Clay Loam SiL - Silt Loam Si - Silt SiCL - Silt Clay Loam SC - Sandy Clay C - Clay SiC - Silty Clay O - Organic	1.2 - .08 0.8 - 0.6 0.6 - 0.3 0.4 - 0.1
<u>STRUCTURE</u>	<u>MOIST CONSISTENCE</u>	<u>MOTTLES</u>	<u>WET CONSISTENCE</u>
G - Single Grain M - Massive CR - Crumb GR - Granular SBK - Subgranular Blocky ABK - Angular Blocky PL - Platy PR - Prismatic	Vfr - Very Friable Fr - Friable Fi - Firm Vfi - Very Firm Efi - Extremely Firm	1 - Few 2 - Common 3 - Many F - Faint D - Distinct P - Prominent f - Fine m - Medium c - Coarse	NS - Non Sticky SS - Slightly Sticky S - Sticky VS - Very Sticky NP - Non Plastic SP - Slightly Plastic P - Plastic VP - Very Plastic



Soils



Disclaimer
iMaps makes every effort to produce and publish the most current and accurate information possible. However, the maps are produced for information purposes, and are **NOT** surveys. No warranties, expressed or implied, are provided for the data therein, its use, or its interpretation.

TABLE 5.—*Estimated*

[Dashed lines in columns mean that soil properties are too variable for reliable estimates to be made. Miscellaneous land types

Soil series and map symbol	Depth to bedrock	Depth to seasonally high water table	Depth from surface (typical profile)	Classification
				Dominant USDA texture
Altavista (AfA)-----	<i>Feet</i> 5-15+	<i>Feet</i> 2	<i>Inches</i> 0-13 13-42 42-48	Fine sandy loam----- Clay loam----- Coarse sandy loam-----
Appling (AgB, AgB2, AgC, AgC2, ApB, ApB2, ApC, ApC2, ApD, AsB, AsB2, AsC, AsC2).	5-15+	10+	0-11 11-44 44-50	Sandy loam or gravelly sandy loam----- Clay loam----- Sandy clay loam-----
Augusta (Au)-----	5-15+	1½	0-13 13-36 36-50	Fine sandy loam----- Sandy clay loam----- Fine sandy loam-----
Bibb (Mapped only in an undifferentiated unit with Wehadkee soils).	4-15+	0	0-36 36-42	Sandy loam----- Sand-----
Buncombe (Bu)-----	10+	2½	0-10 10-40	Loamy sand----- Sand-----
Cecil: (CeB, CeB2, CeC, CeC2, CeD, CeF, CgB, CgB2, CgC, CgC2).	5-15+	10+	0-6 6-59 59-72	Sandy loam or gravelly sandy loam----- Clay to clay loam----- Loam-----
(CIB3, CIC3, CIE3)-----	5-15+	10+	0-6 6-40 40-45	Clay loam----- Clay----- Loam-----
Chewacla (Cm)-----	4-15+	1½	0-6 6-48	Fine sandy loam----- Sandy loam to silt loam-----
Colfax (Cn)-----	5-15+	1½	0-19 19-36 36-45	Sandy loam----- Sandy clay loam----- Sandy loam-----
Congaree (Co, Cp)-----	5-15+	2½	0-32 32-42	Fine sandy loam----- Silt loam to loamy sand-----
Creedmoor (CrB, CrB2, CrC, CrC2, CrE, CtB, CtC)-----	5-10+	(?)	0-12 12-29 29-58 58-96	Sandy loam----- Sandy clay loam to clay loam----- Clay----- Clay to sandy clay-----
Durham (DuB, DuB2, DuC, DuC2)-----	5-15+	10+	0-18 18-60 60-81	Loamy sand----- Sandy clay loam to clay loam----- Sandy loam-----
Enon (EnB, EnB2, EnC, EnC2, EnD2)-----	4-10+	(?)	0-8 8-32 32-38	Fine sandy loam----- Clay----- Clay loam-----
Faceville (FaB, FaB2, FaC2)-----	20+	10+	0-14 14-65 65-72	Sandy loam----- Clay loam----- Sandy loam-----
Georgeville (GeB, GeB2, GeC, GeC2, GeD2)-----	5-15+	10+	0-5 5-55 55-92	Silt loam----- Clay to silty clay loam----- Silt loam-----
Goldshoro (Go)-----	20+	2½	0-15 15-61 61-72	Sandy loam----- Sandy clay loam----- Sandy loam-----
Granville (GrB, GrB2, GrC, GrC2, GrD)-----	5-15+	10+	0-12 12-41 41-50	Sandy loam----- Clay loam----- Clay-----

Footnote at end of table.

TABLE 5.—Estimated properties

Soil series and map symbol	Depth to bedrock	Depth to seasonally high water table	Depth from surface (typical profile)	Classification
				Dominant USDA texture
Helena (HeB, HeB2, HeC, HeC2, HeD).....	<i>Feet</i> 4-15+	<i>Feet</i> (¹)	<i>Inches</i> 0-8 8-36 36-39	Sandy loam..... Sandy clay..... Sandy clay loam.....
Herndon (HrB, HrB2, HrC, HrC2, HrD2, HrE).....	5-15+	10+	0-6 6-40 40-45	Silt loam..... Silty clay loam..... Silty clay loam.....
Lloyd (LdB2, LdC2, LdD2).....	5-15+	10+	0-9 9-38 38-50	Loam..... Clay to clay loam..... Silty clay loam.....
Louisburg (LoB, LoC, LoD, LwB, LwB2, LwC, LwC2). (For properties of Wedowee soils in LwB, LwB2, LwC, and LwC2, refer to the Wedowee series.)	2-4	10+	0-8 8-12 12-36	Loamy sand..... Coarse sandy loam..... Loamy sand.....
Lynchburg (Ly).....	20+	1½	0-13 13-65 65-72	Sandy loam..... Sandy clay loam to sandy loam..... Clay.....
Madison (MdB2, MdC2, MdD2, MdE2).....	5-15+	10+	0-6 6-32 32-48	Sandy loam..... Clay loam..... Silt loam.....
Mantachie (Me).....	5-15+	2	0-45	Sandy loam.....
Mayodan: (MfB, MfB2, MfC, MfC2, MfD2, MfE, MgB, MgB2, MgC, MgC2.)	4-15+	10+	0-7 7-40 40-48	Sandy loam or gravelly sandy loam..... Clay to clay loam..... Sandy loam.....
(MyB, MyB2, MyC, MyC2, MyD).....	3+	10+	0-9 9-24 24-30	Silt loam..... Silty clay loam..... Silt loam.....
Norfolk (NoA, NoB, NoB2, NoC, NoC2).....	20+	10+	0-15 15-65 65-72	Loamy sand..... Sandy clay loam..... Sandy loam.....
Orangeburg (OrB, OrB2, OrC2).....	20+	10+	0-12 12-66 66-72	Loamy sand..... Sandy clay loam to sandy loam..... Loamy sand.....
Pinkston (PkC, PkF).....	2-3	10+	0-25 25-36 36	Sandy loam..... Gravelly sandy loam..... Hard rock.
Plummer (Ps).....	20+	0	0-50 50-60 60-72	Sand..... Sandy loam..... Loamy sand.....
Rains (Ra).....	20+	0	0-8 8-65 65-72	Fine sandy loam..... Sandy clay loam..... Loamy sand.....
Roanoke (Ro).....	5-15+	0	0-11 11-38 38-45	Fine sandy loam..... Clay to sandy clay loam..... Sandy loam.....
Troup (Mapped only in a complex with Wagram soils).	20+	10+	0-49 49-83 83-88	Sand..... Sandy loam to sandy clay loam..... Loamy sand.....

Footnote at end of table.

SUPPORTING INFORMATION

Contents:





General Notes

Unified Soil Classification System

Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING	 Split Spoon	WATER LEVEL	<p style="text-align: center;">  Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time </p> <p>Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.</p>	FIELD TESTS	<p>N Standard Penetration Test Resistance (Blows/Ft.)</p> <p>(HP) Hand Penetrometer</p> <p>(T) Torvane</p> <p>(DCP) Dynamic Cone Penetrometer</p> <p>(PID) Photo-Ionization Detector</p> <p>(OVA) Organic Vapor Analyzer</p>
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DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS	RELATIVE DENSITY OF COARSE-GRAINED SOILS <small>(More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance</small>		CONSISTENCY OF FINE-GRAINED SOILS <small>(50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance</small>		
	Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength Qu, (psf)	Standard Penetration or N-Value Blows/Ft.
	Very Loose	0 - 3	Very Soft	less than 500	0 - 1
	Loose	4 - 9	Soft	500 to 1,000	2 - 4
	Medium Dense	10 - 29	Medium Stiff	1,000 to 2,000	4 - 8
	Dense	30 - 50	Stiff	2,000 to 4,000	8 - 15
	Very Dense	> 50	Very Stiff	4,000 to 8,000	15 - 30
			Hard	> 8,000	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification		
				Group Symbol	Group Name ^B	
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3$ ^E	GW	Well-graded gravel ^F	
			$Cu < 4$ and/or $[Cc < 1 \text{ or } Cc > 3.0]$ ^E	GP	Poorly graded gravel ^F	
		Gravels with Fines: More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F, G, H}	
			Fines classify as CL or CH	GC	Clayey gravel ^{F, G, H}	
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3$ ^E	SW	Well-graded sand ^I	
			$Cu < 6$ and/or $[Cc < 1 \text{ or } Cc > 3.0]$ ^E	SP	Poorly graded sand ^I	
		Sands with Fines: More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G, H, I}	
			Fines classify as CL or CH	SC	Clayey sand ^{G, H, I}	
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	$PI > 7$ and plots on or above "A"	CL	Lean clay ^{K, L, M}	
			$PI < 4$ or plots below "A" line ^J	ML	Silt ^{K, L, M}	
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay ^{K, L, M, N}
			Liquid limit - not dried			Organic silt ^{K, L, M, O}
	Silts and Clays: Liquid limit 50 or more	Inorganic:	PI plots on or above "A" line	CH	Fat clay ^{K, L, M}	
			PI plots below "A" line	MH	Elastic Silt ^{K, L, M}	
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay ^{K, L, M, P}
			Liquid limit - not dried			Organic silt ^{K, L, M, Q}
	Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

^A Based on the material passing the 3-inch (75-mm) sieve.

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

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

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

^E $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

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

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

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

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

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

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

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

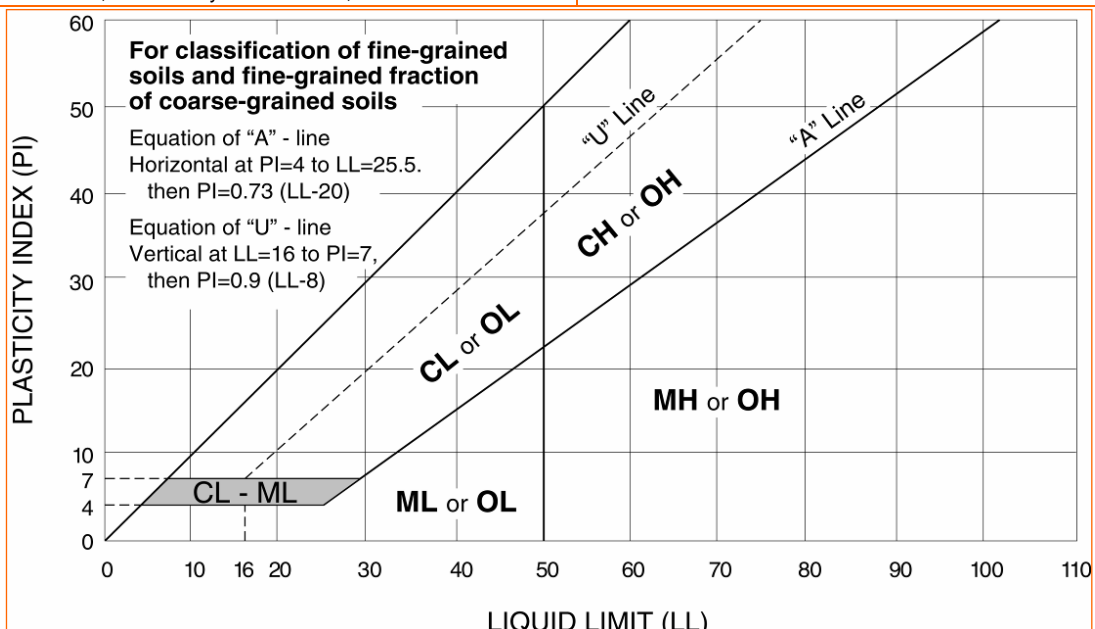
^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

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

^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.



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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Project information.
 2. Work covered by the Contract Documents.
 3. Use of premises.
 4. Specification formats and conventions.

1.2 PROJECT INFORMATION

- A. Project Identification: Swift Creek Elementary School; LS3P Project Number 8201-207411.
1. Project Location: Raleigh, North Carolina.
- B. Owner: Wake County Public Schools, Wake County Office Building, 5625 Dillard Drive, Cary, NC 27518.
- C. Architect Identification: The Contract Documents were prepared for Project by LS3P, 434 Fayetteville Street, Suite 1700, Raleigh, North Carolina 27601.
- D. Construction Manager at Risk: J. E. Dunn
1. Construction Manager has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for construction between Owner and Contractor, according to a separate contract between Owner and Construction Manager.
- E. A web-based Project Information Management System administered by Owner will be used for purposes of managing communication and documents during the construction stage.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Scope of Work: The new Swift Creek Elementary School is based on Wake County's 44 teaching space model and will have a maximum capacity of 508 students.
- B. Type of Contract: Project will be constructed under Construction Manager at Risk contract.

1.4 USE OF PREMISES

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.5 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

- B. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.
- C. Burning: Not permitted.

1.6 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat 2004" numbering system.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include unit-cost, quantity and lump sum allowances.
- C. Related Requirements:
 - 1. Section 012200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.

1.2 DEFINITIONS

- A. Unit Cost Allowance is a dollar amount for a specified unit of work established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Quantity Allowance is an extent of work established in lieu of specific direction in the Contract Documents, used to establish extent of certain work results whose actual scope have not been determined at the time the Contract Documents are issued. The requirements for systems, products, material, equipment and installation are included in the technical specification. Include in the lump sum bid all cost to perform the work established by Quantity Allowance. If necessary, additional requirements will be issued by Change Order.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.4 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific activities ordered by Owner under allowance and shall include delivery to Project site of material.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.7 UNIT-COST ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include delivery to Project site. Taxes are not included.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.9 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-

place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
 3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No 01: Site Lighting & Power Sleeves (2" Sch. 40 PVC)
1. Description: Include the quantities indicated for the installation of 2" schedule 40 PVC site lighting and site power sleeves not indicated in the construction documents.
 2. Unit of Measurement: LF
 3. Quantity Allowance: 200
- B. Allowance No 02: Mass Rock
1. Description: Include the quantity indicated for the removal of rock in open areas and disposal off-site at the discretion of the CMaR.
 2. Unit of Measurement: CY
 3. Quantity Allowance: 15
- C. Allowance No 03: Trench Rock

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1. Description: Include the quantity indicated for the removal of rock in trenches and pits and disposal off-site at the discretion of the CMAr.
 2. Unit of Measurement: CY
 3. Quantity Allowance: 15
- D. Allowance No 04: Unsuitable soils (On-site)
1. Description: Include the quantity indicated for the removal of undercut and waste unsuitable soils or existing loose fill and disposal on-site at the discretion of the CMAr.
 2. Unit of Measurement: CY
 3. Quantity Allowance: 3,500
- E. Allowance No 05: Unsuitable Soils (Off-site)
1. Description: Include the quantity indicated for the removal of undercut and waste unsuitable soils and disposal off-site at the discretion of the CMAr.
 2. Unit of Measurement: CY
 3. Quantity Allowance: 6,500
- F. Allowance No 06: Replacement Soil (Off-site)
1. Description: Include the quantity indicated for the replacement of removed rock or unsuitable soils from off-site suitable soil at the discretion of the CMAr.
 2. Unit of Measurement: CY
 3. Quantity Allowance: 8,000
- G. Allowance No 07: Replacement Aggregate Base Course (ABC).
1. Description: Include the quantity indicated for the replacement of removed rock or unsuitable soils with aggregate base course (ABC), including placement and compaction at the discretion of the CMAr.
 2. Unit of Measurement: CY
 3. Quantity Allowance: 1,500
- H. Allowance No 08: Replacement No.57 Washed Stone.
1. Description: Include the quantity indicated for the replacement of removed rock or unsuitable soils with No.57 washed stone, including placement and compaction at the discretion of the CMAr.
 2. Unit of Measurement: CY
 3. Quantity Allowance: 500
- I. Allowance No 09: Woven Geo-Textile Fabric in place.
1. Description: Include the quantity indicated for woven geo-textile fabric in place for soil separation, stabilization, and reinforcement at the discretion of the CMAr.
 2. Unit of Measurement: SY
 3. Quantity Allowance: 1,000
- J. Allowance No 10: Biaxial Geo-Grid in place.
1. Description: Include the quantity indicated for biaxial geo-grid in place for drainage, load distribution, soil separation, and stabilization at the discretion of the CMAr.
 2. Unit of Measurement: SY
 3. Quantity Allowance: 500
- K. Allowance No 11: High-Capacity French Drain.

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1. Description: Include the quantity indicated for the placement and installation of high-capacity French drain at the discretion of the CMAr.
 2. Unit of Measurement: LF
 3. Quantity Allowance: 200
- L. Allowance No 12: Lime Soil Stabilization.
1. Description: Include the quantity indicated for lime soil stabilization of unsuitable soils at the discretion of the CMAr.
 2. Unit of Measurement: SY
 3. Quantity Allowance: 1,000
- M. Allowance No 13: Temporary Construction Road(s), Parking and Laydown areas - Aggregate Base Course (ABC).
1. Description: Include the quantity indicated for the placement and installation of aggregate base course (ABC) for the construction of temporary construction roads, parking, and laydown areas at the discretion of the CMAr.
 2. Unit of Measurement: TON
 3. Quantity Allowance: TBD
- N. Allowance No 14: Temporary Construction Road(s), Parking and Laydown areas - Tensar TX-160 Geo-Grid.
1. Description: Include the quantity indicated for the placement and installation of Tensar TX-160 Geo-Grid for the construction of temporary construction roads, parking, and laydown areas at the discretion of the CMAr.
 2. Unit of Measurement: SY
 3. Quantity Allowance: TBD
- O. Allowance No 15: Removal of ABC from Temporary Construction Road(s), Parking and Laydown areas.
1. Description: Include the quantity indicated for the removal and disposal of contaminated and non-contaminated aggregate base course (ABC) from the construction of temporary construction roads, parking, and laydown areas off-site at the discretion of the CMAr.
 2. Unit of Measurement: TON
 3. Quantity Allowance: TBD
- P. Allowance No 16: Orange Construction / Temporary Tree Protection Fence
1. Description: Include the quantities indicated and installation of temporary orange fencing for the use in construction and tree protection to be used at the direction of the CMAr.
 2. Unit of Measurement: LF
 3. Quantity Allowance: TBD
 4. Clarification: Quantities listed are in addition to those in the base bid.
- Q. Allowance No 17: Removal of Unanticipated and Abandoned Structures, Tanks, or Refrigerant
1. Description: Bidder shall include in their Base Bid a Lump Sum Allowance of \$21,000.00 for Removal of Unanticipated and Abandoned Structures including but not limited to tanks, refrigerant, debris laden fill, underground utilities, and underground structures.
- R. Allowance No 18: Exterior Signage
1. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$5,000.00 for purchase and installation of Exterior signage, as directed by the owner, architect, or local AHJ.
 2. Clarification: Allowance usage is in addition to the signage indicated in the contract documents and shall not be utilized for signage identified within the contract documents.

- S. Allowance No 19: Standard Duty Asphalt Patching and Repair
1. Description: Include the quantity indicated for standard duty asphalt pavement repairs and patching per 2" pavement section to be used at the direction of the owner.
 2. Unit of Measurement: SY
 3. Quantity Allowance: TBD
 4. Clarification: Price to include saw cutting, removal and disposal of existing and/or damaged asphalt, replacement of subbase, and patching.
- T. Allowance No 20: Heavy Duty Asphalt Patching and Repair
1. Description: Include the quantity indicated for heavy duty asphalt pavement repairs and patching per 2" pavement section to be used at the direction of the owner.
 2. Unit of Measurement: SY
 3. Quantity Allowance: TBD
 4. Clarification: Price to include saw cutting, removal and disposal of existing and/or damaged asphalt, replacement of subbase, and patching.
- U. Allowance No 21: Buffer Plantings
1. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$10,000.00 for the purchase and installation of buffer plantings as directed by the owner, architect, or AHJ.
 2. Clarification: Allowance usage is for buffer planting in addition to those indicated on the contract drawings.
- V. Allowance No 22: Storm Pond Plantings
1. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$50,000.00 for the purchase and installation of storm pond plantings as required for erosion control phasing or as directed by the owner, architect, or AHJ.
 2. Clarification: Allowance usage is for storm pond planting in addition to those indicated on the contract drawings.
- W. Allowance No 23: Temporary 8' Chain-link Fencing
1. Description: Include the quantity indicated for 8' tall temporary chain-link fencing.
 2. Unit of Measurement: LF
 3. Quantity Allowance: TBD
 4. Clarification: Price to include acquisition, installation, periodic maintenance, tear-down and removal from site.
- X. Allowance No 24: 24" x 24" Access Panels
1. Description: Include the quantity indicated and installation of 24" x 24" access panels installed in walls or ceilings as directed by the owner, architect, or AHJ.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 15
 4. Clarification: Allowance to include all associated framing required. Allowance is for additional access panels not indicated in the contract documents.
- Y. Allowance No 25: Fire Extinguishers and Cabinets
1. Description: Include the quantity indicated and installation of both 10lb ABC fire extinguishers and associated extinguisher cabinets as directed by the owner, architect, or AHJ.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 5

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4. Clarification: Allowance usage is in addition to the fire extinguishers and cabinets indicated in the contract documents and shall not be utilized for fire extinguishers and cabinets identified within the contract documents.
- Z. Allowance No 26: Interior Signage
1. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$3,000.00 for the purchase and installation of interior signage as directed by the owner, architect, or AHJ.
 2. Clarification: Allowance usage is in addition to the signage indicated in the contract documents and shall not be utilized for signage identified within the contract documents.
- AA. Allowance No 27: Fire Sprinkler Heads
1. Description: Include the quantity indicated and installation of fire sprinkler heads at locations as directed by the owner, architect, or AHJ.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 20
 4. Clarification: Include 15 linear feet of branch piping and associated fittings for a complete installation of each fire sprinkler head.
- BB. Allowance No 28: Occupancy Sensors
1. Description: Include the quantity indicated and installation of occupancy sensors at locations as directed by the owner or architect.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 10
 4. Clarification: Include 30 linear feet of conduit and wire for a complete installation of each occupancy sensor. Allowance usage is in addition to occupancy sensors indicated in the contract documents and shall not be utilized for occupancy sensors identified within the contract documents.
- CC. Allowance No 29: Duplex Receptacles
1. Description: Include the quantity indicated and installation of duplex receptacles at locations as directed by the owner or architect.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 10
 4. Clarification: Include 30 linear feet of conduit and wire for a complete installation of each duplex receptacle. Allowance usage is in addition to duplex receptacles indicated in the contract documents and shall not be utilized for duplex receptacles identified within the contract documents.
- DD. Allowance No 30: Emergency Lights
1. Description: Include the quantity indicated and installation of emergency lights at locations as directed by the owner, architect, or AHJ.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 10
 4. Clarification: Include 30 linear feet of conduit and wire for a complete installation of each emergency light. Allowance usage is in addition to emergency lights indicated in the contract documents and shall not be utilized for emergency lights identified within the contract documents.
- EE. Allowance No 31: Exit Lights
1. Description: Include the quantity indicated and installation of exit lights at locations as directed by the owner, architect, or AHJ.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 5

4. Clarification: Include 30 linear feet of conduit and wire for a complete installation of each exit light. Allowance usage is in addition to exit lights indicated in the contract documents and shall not be utilized for exit lights identified within the contract documents.
- FF. Allowance No 32: 110CD speaker/strobe Fire Alarms
1. Description: Include the quantity indicated and installation of Fire Alarm Speaker/Strobes in either the ceiling or wall at locations as directed by the owner, architect, or AHJ.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 10
 4. Clarification: Include 30 linear feet of conduit and 200' of wire for a complete installation of each device. Allowance usage is in addition to fire alarm speaker/strobes indicated in the contract documents and shall not be utilized for fire alarm speaker/strobes identified within the contract documents.
- GG. Allowance No 33: Fire Alarm Pull Stations
1. Description: Include the quantity indicated and installation of manual Fire Alarm Pull Stations with protective shields at locations as directed by the owner, architect, or AHJ.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 10
 4. Clarification: Include 30 linear feet of conduit and 200' of wire for a complete installation of each device. Allowance usage is in addition to fire alarm pull stations indicated in the contract documents and shall not be utilized for fire alarm pull stations identified within the contract documents.
- HH. Allowance No 34: Fire Alarm Duct Detector & Remote Annunciator Indicator Light (RAIL)
1. Description: Include the quantity indicated and installation of Fire Alarm Duct Detector & RAIL at locations as directed by the owner, architect, or AHJ.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 5
 4. Clarification: Include 30 linear feet of conduit and 30' of wire for each duct detector and 50 linear feet of conduit and 30' of wiring for each RAIL for a complete installation of each device. Allowance usage is in addition to duct detectors and RAIL indicated in the contract documents and shall not be utilized for duct detectors and RAIL identified within the contract documents.
- II. Allowance No 35: 2-Port Data Outlets
1. Description: Include the quantity indicated and installation of 2-port data outlets at locations as directed by the owner or architect.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 10
 4. Clarification: Include 30 linear feet of conduit and 30' of cabling per drop for a complete installation of each device. Allowance usage is in addition to 2-port data outlets indicated in the contract documents and shall not be utilized for 2-port data outlets identified within the contract documents.
- JJ. Allowance No 36: BDA System
1. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$75,000.00 for a complete BDA system.
- KK. Allowance No 37: CCTV Cameras
1. Description: Include the quantity indicated and installation of CCTV security cameras at locations as directed by the owner or architect.
 2. Unit of Measurement: EA

3. Quantity Allowance: 5
 4. Clarification: Include 30 linear feet of conduit and 30' of cabling for a complete installation of each device. Allowance usage is in addition to security cameras indicated in the contract documents and shall not be utilized for security cameras identified within the contract documents.
- LL. Allowance No 38: Wireless Clocks
1. Description: Include the quantity indicated and installation of wireless wall clocks at locations as directed by the owner or architect.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 10
- MM. Allowance No 39: Temporary/Permanent Power
1. Description: Base bid shall include a Lump Sum Allowance of \$20,000.00 for temporary and permanent power and water fees to be used at the discretion of the CMAA.
- NN. Allowance No 40: Temporary/Permanent Water
1. Description: Base bid shall include a Lump Sum Allowance of \$50,000.00 for temporary and permanent power and water fees to be used at the discretion of the CMAA.
- OO. Allowance No 41: Duke Energy Permanent Power Fees
1. Description: Base bid shall include a Lump Sum Allowance of \$50,000.00 for Duke Energy permanent power fees to be used at the discretion of the CMAA.
- PP. Allowance No 42: Dumpster Cost
1. Description: Base bid shall include a Lump Sum Allowance of \$75,000.00 for temporary dumpster fees to be used at the discretion of the CMAA.
- QQ. Allowance No 43: Liquid Asphalt Escalation
1. Description: Base bid shall include a Lump Sum Allowance of \$ TBD for escalation of liquid asphalt to be used at the discretion of the CMAA.
- RR. Allowance No 44: Topping Out Ceremony
1. Description: Base bid shall include a Lump Sum Allowance of \$2,000.00 for a topping out ceremony to be used at the discretion of the Owner.
- SS. Allowance No 45: Plumbing Disconnect for Modular Classroom Units
1. Description: Include the quantity indicated for the safe disconnect of all plumbing services within the modular classroom units.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 2
- TT. Allowance No 46: Mechanical Disconnect for Modular Classroom Units
1. Description: Include the quantity indicated for the safe disconnect of all mechanical services within the modular classroom units.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 2
- UU. Allowance No 47: Electrical Disconnect for Modular Classroom Units

1. Description: Include the quantity indicated for the safe disconnect of all electrical services within the modular classroom units.
2. Unit of Measurement: EA
3. Quantity Allowance: 2

END OF SECTION 012100

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices, including quantity allowances.
- B. Related Sections include the following:
 - 1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.2 DEFINITIONS

- A. Unit price is an amount proposed by bidders, stated on the Form of Proposal, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.
- B. Quantity Allowance is an extent of work established in lieu of specific direction in the Contract Documents, used to establish extent of certain work results whose actual scope has not been determined at the time the Contract Documents are issued. The requirements for systems, products, material, equipment and installation are included in the technical specification. Include in the lump sum bid all cost to perform the work established by Quantity Allowance. If necessary, additional requirements will be issued by Change Order.

1.3 QUANTITY ALLOWANCES

- A. Include in the lump sum contract all costs related to the work described in the quantity allowances.
- B. Measurement: Owner will engage third party soils and material engineer to verify quantities of rock and soil, measured in place.
- C. Perform Work under quantity allowances only as authorized. Authorized work includes work required by Drawings and the Specifications and work authorized in writing by Architect.
- D. When work is performed and actual quantity or extent is measured, the Contract Sum will be adjusted by Change Order based on Unit Cost indicated in the Agreement.
- E. Submit claims for increased costs because of a change in scope or nature of the work described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
 - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.

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 list 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 No 1: Site Lighting & Power Sleeves (2" Sch. 40 PVC)
 - 1. Description: Include the quantities indicated for the installation of 2" schedule 40 PVC site lighting and site power sleeves not indicated in the construction documents.
 - 2. Unit of Measurement: Linear Foot (LF)
 - 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- B. Unit Price No 2: Mass Rock
 - 1. Description: Include the quantity indicated for the removal of rock in open areas and disposal off-site at the discretion of the CMaR.
 - 2. Unit of Measurement: Cubic Yard (CY)
 - 3. Method of Measurement: Quantities shall be verified by a soils and materials engineer employed by the Owner.
 - 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site, excavation and labor.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - d. Legal disposal of all materials.
 - e. All disposal fees.
 - 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- C. Unit Price No 3: Trench Rock
 - 1. Description: Include the quantity indicated for the removal of rock in trenches and pits and disposal off-site at the discretion of the CMaR.
 - 2. Unit of Measurement: Cubic Yard (CY)
 - 3. Method of Measurement: Quantities shall be verified by a soils and materials engineer employed by the Owner.
 - 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site, excavation and labor.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.

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- d. Legal disposal of all materials.
 - e. All disposal fees.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- D. Unit Price No 4: Unsuitable soils (On-site)
- 1. Description: Include the quantity indicated for the removal of undercut and waste unsuitable soils or existing loose fill and disposal on-site at the discretion of the CMAA.
 - 2. Unit of Measurement: Cubic Yard (CY)
 - 3. Method of Measurement: Quantities shall be verified by a soils and materials engineer employed by the Owner.
 - 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site, excavation and labor.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - d. Legal disposal of all materials.
 - e. All disposal fees.
 - 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- E. Unit Price No 5: Unsuitable Soils (Off-site)
- 1. Description: Include the quantity indicated for the removal of undercut and waste unsuitable soils and disposal off-site at the discretion of the CMAA.
 - 2. Unit of Measurement: Cubic Yard (CY)
 - 3. Method of Measurement: Quantities shall be verified by a soils and materials engineer employed by the Owner.
 - 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site, excavation and labor.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - d. Legal disposal of all materials.
 - e. All disposal fees.
 - 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- F. Unit Price No 6: Replacement Soil (Off-site)
- 1. Description: Include the quantity indicated for the replacement of removed rock or unsuitable soils from off-site suitable soil at the discretion of the CMAA.
 - 2. Unit of Measurement: Cubic Yard (CY)
 - 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - d. Suitable soil materials from contractor's off-site source.
 - e. Placement and compaction of soil into void remaining from removed rock or unsuitable/existing loose soil.
 - 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- G. Unit Price No 7: Replacement Aggregate Base Course (ABC).

1. Description: Include the quantity indicated for the replacement of removed rock or unsuitable soils with aggregate base course (ABC), including placement and compaction at the discretion of the CMAA.
 2. Unit of Measurement: Cubic Yard (CY)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - d. Certified ABC materials from contractor's off-site source.
 - e. Placement and compaction of soil into void remaining from removed rock or unsuitable/existing loose soil.
 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- H. Unit Price No 8: Replacement No.57 Washed Stone.
1. Description: Include the quantity indicated for the replacement of removed rock or unsuitable soils with No.57 washed stone, including placement and compaction at the discretion of the CMAA.
 2. Unit of Measurement: Cubic Yard (CY)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - d. Certified #57 washed stone from contractor's off-site source.
 - e. Placement and compaction of soil into void remaining from removed rock or unsuitable/existing loose soil.
 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- I. Unit Price No 9: Woven Geo-Textile Fabric in place.
1. Description: Include the quantity indicated for woven geo-textile fabric in place for soil separation, stabilization, and reinforcement at the discretion of the CMAA.
 2. Unit of Measurement: Square Yard (SY)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- J. Unit Price No 10: Biaxial Geo-Grid in place.
1. Description: Include the quantity indicated for biaxial geo-grid in place for drainage, load distribution, soil separation, and stabilization at the discretion of the CMAA.
 2. Unit of Measurement: Square Yard (SY)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

- K. Unit Price No 11: High-Capacity French Drain.
1. Description: Include the quantity indicated for the placement and installation of high-capacity French drain at the discretion of the CMAr.
 2. Unit of Measurement: Linear Foot (LF)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- L. Unit Price No 12: Lime Soil Stabilization
1. Description: Include the quantity indicated for the placement and installation of Lime Soil Stabilization at the discretion of the CMAr.
 2. Unit of Measurement: Square Yard (SY)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- M. Unit Price No 13: Temporary Construction Road(s), Parking and Laydown areas - Aggregate Base Course (ABC).
1. Description: Include the quantity indicated for the placement and installation of aggregate base course (ABC) for the construction of temporary construction roads, parking, and laydown areas at the discretion of the CMAr.
 2. Unit of Measurement: TON
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- N. Unit Price No 14: Temporary Construction Road(s), Parking and Laydown areas - Tensar TX-160 Geo-Grid.
1. Description: Include the quantity indicated for the placement and installation of Tensar TX-160 Geo-Grid for the construction of temporary construction roads, parking, and laydown areas at the discretion of the CMAr.
 2. Unit of Measurement: Square Yard (SY)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- O. Unit Price No 15: Removal of ABC from Temporary Construction Road(s), Parking and Laydown areas.

1. Description: Include the quantity indicated for the removal and disposal of contaminated and non-contaminated aggregate base course (ABC) from the construction of temporary construction roads, parking, and laydown areas off-site at the discretion of the CMAA.
 2. Unit of Measurement: TON
 3. Method of Measurement: Quantities shall be verified by a soils and materials engineer employed by the Owner.
 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site, excavation and labor.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - d. Legal disposal of all materials.
 - e. All disposal fees.
 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- P. Unit Price No 16: Orange Construction / Temporary Tree Protection Fence
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Description: Include the quantities indicated and installation of temporary orange fencing for the use in construction and tree protection to be used at the direction of the CMAA.
 3. Unit of Measurement: Linear Foot (LF)
 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- Q. Unit Price No 17: Removal of Unanticipated and Abandoned Structures, Tanks, or Refrigerant
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Bidder shall include in their Base Bid a Lump Sum Allowance of \$21,000.00 for Removal of Unanticipated and Abandoned Structures including but not limited to tanks, refrigerant, debris laden fill, underground utilities, and underground structures.
 3. Unit of Measurement: Lump Sum (LS)
 4. Include the following in the unit price:
 - a. All materials, equipment, transport to/from site and labor for complete demolition and removal.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 5. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- R. Unit Price No 18: Exterior Signage
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$5,000.00 for purchase and installation of Exterior signage, as directed by the owner, architect, or local AHJ.
 3. Unit of Measurement: Lump Sum (LS)
 4. Include the following in the unit price:

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- a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- S. Unit Price No 19: Standard Duty Asphalt Patching and Repair
1. Description: Include the quantity indicated for standard duty asphalt pavement repairs and patching per 2" pavement section to be used at the direction of the owner.
 2. Unit of Measurement: Square Yard (SY)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- T. Unit Price No 20: Heavy Duty Asphalt Patching and Repair
1. Description: Include the quantity indicated for heavy duty asphalt pavement repairs and patching per 2" pavement section to be used at the direction of the owner.
 2. Unit of Measurement: Square Yard (SY)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- U. Unit Price No 21: Buffer Plantings
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$10,000.00 for the purchase and installation of buffer plantings as directed by the owner, architect, or AHJ.
 3. Unit of Measurement: Lump Sum (LS)
 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 5. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- V. Unit Price No 22: Storm Pond Plantings
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$50,000.00 for the purchase and installation of buffer plantings as directed by the owner, architect, or AHJ.
 3. Unit of Measurement: Lump Sum (LS)
 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.

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- b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- W. Unit Price No 23: Temporary 8' Chain-link Fencing
- 1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 - 2. Description: Include the quantity indicated for 8' tall temporary chain-link fencing.
 - 3. Unit of Measurement: Linear Foot (LF)
 - 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- X. Unit Price No 24: 24" x 24" Access Panels
- 1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 - 2. Description: Include the quantity indicated and installation of 24" x 24" access panels installed in walls or ceilings as directed by the owner, architect, or AHJ.
 - 3. Unit of Measurement: Per device (1 location) (EA)
 - 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- Y. Unit Price No 25: Fire Extinguishers and Cabinets
- 1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 - 2. Description: Include the quantity indicated and installation of both 10lb ABC fire extinguishers and associated extinguisher cabinets as directed by the owner, architect, or AHJ.
 - 3. Unit of Measurement: Per device (1 location) (EA)
 - 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- Z. Unit Price No 26: Interior Signage
- 1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 - 2. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$3,000.00 for the purchase and installation of interior signage as directed by the owner, architect, or AHJ.
 - 3. Unit of Measurement: Lump Sum (LS)

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4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 5. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- AA. Unit Price No 27: Fire Sprinkler Heads
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Description: Include the quantity indicated and installation of fire sprinkler heads at locations as directed by the owner, architect, or AHJ.
 3. Unit of Measurement: Per device (1 location) (EA)
 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- BB. Unit Price No 28: Occupancy Sensors
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Description: Include the quantity indicated and installation of occupancy sensors at locations as directed by the owner or architect.
 3. Unit of Measurement: Per device (1 location) (EA)
 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- CC. Unit Price No 29: Duplex Receptacles
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Description: Include the quantity indicated and installation of duplex receptacles at locations as directed by the owner or architect.
 3. Unit of Measurement: Per device (1 location) (EA)
 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- DD. Unit Price No 30: Emergency Lights
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.

2. Description: Include the quantity indicated and installation of emergency lights at locations as directed by the owner, architect, or AHJ.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

EE. Unit Price No 31: Exit Lights

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated and installation of exit lights at locations as directed by the owner, architect, or AHJ.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

FF. Unit Price No 32: 110CD speaker/strobe Fire Alarms

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated and installation of Fire Alarm Speaker/Strobes in either the ceiling or wall at locations as directed by the owner, architect, or AHJ.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

GG. Unit Price No 33: Fire Alarm Pull Stations

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated and installation of manual Fire Alarm Pull Stations with protective shields at locations as directed by the owner, architect, or AHJ.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

- HH. Unit Price No 34: Fire Alarm Duct Detector & Remote Annunciator Indicator Light (RAIL)
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Description: Include the quantity indicated and installation of Fire Alarm Duct Detector & RAIL at locations as directed by the owner, architect, or AHJ.
 3. Unit of Measurement: Per device (1 location) (EA)
 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- II. Unit Price No 35: 2-Port Data Outlets
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Description: Include the quantity indicated and installation of 2-port data outlets at locations as directed by the owner or architect.
 3. Unit of Measurement: Per device (1 location) (EA)
 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- JJ. Unit Price No 36: BDA System
1. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$75,000.00 for a complete BDA system.
 2. Unit of Measurement: Lump Sum (LS)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 4. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- KK. Unit Price No 37: CCTV Cameras
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Description: Include the quantity indicated and installation of CCTV security cameras at locations as directed by the owner or architect.
 3. Unit of Measurement: Per device (1 location) (EA)
 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

LL. Unit Price No 38: Wireless Clocks

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated and installation of wireless wall clocks at locations as directed by the owner or architect.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

MM. Unit Price No 39: Temporary/Permanent Power

1. Description: Base bid shall include a Lump Sum Allowance of \$20,000.00 for temporary and permanent power and water fees to be used at the discretion of the CmaR.
2. Unit of Measurement: Lump Sum (LS)
3. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

NN. Unit Price No 40: Temporary/Permanent Water

1. Description: Base bid shall include a Lump Sum Allowance of \$50,000.00 for temporary and permanent power and water fees to be used at the discretion of the CMAr.
2. Unit of Measurement: Lump Sum (LS)
3. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

OO. Unit Price No 41: Duke Energy Permanent Power Fees

1. Description: Base bid shall include a Lump Sum Allowance of \$50,000.00 for Duke Energy permanent power fees to be used at the discretion of the CMAr.
2. Unit of Measurement: Lump Sum (LS)
3. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

PP. Unit Price No 42: Dumpster Cost

1. Description: Base bid shall include a Lump Sum Allowance of \$75,000.00 for temporary dumpster fees to be used at the discretion of the CMAr.
2. Unit of Measurement: Lump Sum (LS)
3. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

QQ. Unit Price No 43: Liquid Asphalt Escalation

1. Description: Base bid shall include a Lump Sum Allowance of \$TBD for escalation of liquid asphalt to be used at the discretion of the CMAr.
2. Unit of Measurement: Lump Sum (LS)
3. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

RR. Unit Price No 44: Topping Out Ceremony

1. Description: Base bid shall include a Lump Sum Allowance of \$2,000.00 for a topping out ceremony to be used at the discretion of the Owner.
2. Unit of Measurement: Lump Sum (LS)
3. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

SS. Unit Price No 45: Plumbing Disconnect for Modular Classroom Units

1. Description: Include all disconnects for plumbing services for the modular classroom units in the quantity indicated.
2. Unit of Measurement: Per device (1 location) (EA)
3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

TT. Unit Price No 46: Mechanical Disconnect for Modular Classroom Units

1. Description: Include all disconnects for mechanical services for the modular classroom units in the quantity indicated.
2. Unit of Measurement: Per device (1 location) (EA)
3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

UU. Unit Price No 47: Electrical Disconnect for Modular Classroom Units

1. Description: Include all disconnects for electrical services for the modular classroom units in the quantity indicated.
2. Unit of Measurement: Per device (1 location) (EA)
3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

END OF SECTION 012200

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SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

- A. Preferred Alternate: A system or product identified by Owner as offering a long-term value to Owner, based on maintenance, durability, warranties, compatibility with existing equipment or other characteristics that would justify a higher initial cost. Indicate the differential in costs between the base bid product that meets the specification and the preferred alternate.

1.3 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other work of the Contract.
- C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Bus Canopy.
 - 1. Base Bid: Provide prefabricated bus canopy as shown on Drawings.
 - 2. Alternate: Provide steel-framed metal canopy as shown on Drawings.
- B. Alternate No. 2: Resilient Flooring.
 - 1. Base Bid: Provide VCT as shown on the Drawings and specified in Section 096519 "Resilient Tile Flooring."
 - 2. Alternate: Provide linoleum tile as shown on Drawings and as specified in Section 096543 "Linoleum Flooring."
- C. Alternate No. 3: Fall Protection.
 - 1. Base Bid: No fall protection.
 - 2. Alternate: Provide a full personal fall arrest system including permanent, non-penetrating standing seam metal roof anchors on both East and West slopes of roof in a pattern to fully cover all locations of the roof..

3.2 SCHEDULE OF OWNER-PREFERRED ALTERNATES

- A. Alternate No. P1: Intrusion Detection/Burglar Alarm Panels & Associated Hardware.
 - 1. Alternate: Furnish and install Gemini by Napco Security Technologies, (no substitutions).
- B. Alternate No. P2: Theatrical Lighting Dimmers and Controls.
 - 1. Alternate: Furnish and install ETC Visual Environment Technologies, (no substitutions).
- C. Alternate No. P3: Convection Oven at Food Preparation.
 - 1. Alternate: Furnish and install Blodgett Convection Oven, (no substitutions).
- D. Alternate No. P4: Food Processor at Food Preparation.
 - 1. Alternate: Furnish and install Colorpoint Serving Lines, (no substitutions).
- E. Alternate No. P5: Door Hardware.
 - 1. Alternate: Furnish and install the following:
 - a. Cylinders and Locks: Best, (no substitutions).
 - b. Door Closers: Stanley or LCN, (no substitutions).
 - c. Panic Devices: Precision or Von Duprin, (no substitutions).
- F. Alternate No. P6: Web-Based Controls.
 - 1. Alternate: Furnish and install Honeywell, Johnson Control, Schneider Electric or Brady Trane, (no substitutions).
- G. Alternate No. P7: Access Control.
 - 1. Alternate: Furnish and install S2 Netbox, (no substitutions).
- H. Alternate No. P8: Fire Alarm.
 - 1. Alternate: Furnish and install Siemens, SimplexGrinnell, or Mircom, (no substitutions).

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for products selected under an allowance.
 - 2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
 - 3. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.2 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 that are not required in order to meet other Project requirements but may offer advantage to Owner.

1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit one copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use form provided by Architect.
 - 2. 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. Evidence that the proposed product does not require 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.
 - d. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section, indicating all differences from specification. 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.
 - 1) Contractor shall provide a marked-up specification section to provide a point-by-point comparison between the specified product and the proposed substitution. The point-by-point comparison shall indicate each point of compliance, non-compliance, and variance between the specified and proposed product.

- e. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - f. Evidence that proposed product provides specified warranty.
 - g. Samples, where applicable or requested.
 - h. Certificates and qualification data, where applicable or requested.
 - i. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - j. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - k. Research reports evidencing compliance with building code in effect for Project.
 - l. 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 date of receipt of purchase order, lack of availability, or delays in delivery.
 - m. Cost information, including a proposal of change, if any, in the Contract Sum.
 - n. 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.
 - o. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within three days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 10 days prior to bid, or three 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.

1.4 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.

1.5 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 During Construction:
 1. Requests for substitution following award of contract must comply with requirements of this article and are restricted to those necessitated by the following circumstances:
 - a. Specified product is no longer available for purchase.
 - b. Specified product is not available within schedule requirements of project.
 - c. Specified product is not compatible with other product approved for project.

d. Specified warranty is not available from any manufacturer.

B. Substitutions, General:

1. Requests that do not include the completed form, including point-by-point comparison, and authorized signature will not be reviewed.
2. Include sufficient data with request so that direct comparison of proposed item to specified item can be made. Knowledge and experience of applicator and warranty may be an integral part of specification. Provide data applicator/installer qualifications, such as experience, organizations, references, projects, and dates.
3. Verify that submitted product meets requirements indicated before submitting request, and note any deviations. Inadequate warranty, vagueness of submittal, failure to meet project requirements, or insufficient data may be cause for disapproval of request. Architect's rejection of requested substitution is final, and does not require documentation or further justification. Architect's approval is subject to reconsideration at any time in life of Contract, if evidence is later discovered that proposed substitution is incompatible or fails to comply with indicated performance or other requirements.
4. Approvals are based upon the opinion, knowledge, information, and belief of the Architect at time of issuance of approval and reliance upon data submitted. Approvals are subject to reconsideration as additional data, materials, workmanship, and coordination with other work are observed and reviewed. In proposing items for approval, Bidder/Contractor assumes all risks, costs, and responsibilities for product's acceptance by authorities having jurisdiction, integration into Work, and performance.

C. 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 Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible and has been coordinated with other portions of the Work.
 - f. Requested substitution provides specified warranty.
 - g. 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.

D. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after the Notice to Proceed. 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 Contractor's construction schedule.
- f. Requested substitution has received necessary approvals of authorities having jurisdiction.
- g. Requested substitution is compatible and has been coordinated with other portions of the Work.
- h. Requested substitution provides specified warranty.
- i. 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 012500

CONTRACTOR'S REQUEST FOR SUBSTITUTION FORM

Project:	<u>Swift Creek Elementary School</u>	Project No.:	<u>8201-207411</u>
To:	<u>LS3P ASSOCIATES LTD.</u>	Specification Section #:	<u></u>
	<u>434 Fayetteville Street, Suite 1700</u>	Contractor:	<u></u>
	<u>Raleigh, NC 27601</u>	Requested by:	<u></u>
Attn.:	<u>Mary Brehler</u>	Phone:	<u></u>
Phone:	<u>919-829-2706</u>	Fax:	<u></u>
Fax:	<u>919-829-2730</u>	Email:	<u></u>
Email:	<u>marybrehler@ls3p.com</u>		

Reason for not providing specified item:

Savings to Owner for accepting substitution:

Specified Product/Fabrication Method
(List name/description; model no.; manufacturer):

Required Information for <i>Specified</i> Product:	Attached:
Point by Point Comparative Product Data	<input type="checkbox"/>
Tests	<input type="checkbox"/>
Reports	<input type="checkbox"/>
Fabrication Drawings	<input type="checkbox"/>
<u>Samples (Where Applicable)</u>	<input type="checkbox"/>

Proposed Product/Fabrication Method
(List trade name/description; model no.; manufacturer) :

Required Information for <i>Proposed</i> Product:	Attached:
Point by Point Comparative Product Data	<input type="checkbox"/> (Required)
Tests	<input type="checkbox"/>
Reports	<input type="checkbox"/>
Fabrication Drawings	<input type="checkbox"/>
<u>Samples (Where Applicable)</u>	<input type="checkbox"/>

List of Related Changes/Modifications:

Differences between proposed substitution
and specified product:

Does proposed product/fabrication method affects other parts of the Work? No Yes: Explain _____

Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product as utilized for this project, except as noted herein.
- Qualifications of manufacturer, installer, and other specified parties meet the specified qualifications.
- Same special warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source for replacement parts, as applicable, is available as that specified.
- Proposed substitution does not affect dimensions and functional clearances, except as noted herein.
- Proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
- Failure of proposed substitution to produce indicated results will not be considered grounds for additional payment or time.

For the Bidder: _____

Submitted by: _____

Signed: _____

Firm: _____

Telephone: _____

Fax: _____

Email: _____

For the Manufacturer:

Submitted by: _____

Signed: _____

Firm: _____

Telephone: _____

Fax: _____

Email: _____

END OF CONTRACTOR'S REQUEST FOR SUBSTITUTION FORM

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.2 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 1) Excavation Related Changes: Contractor shall coordinate with Owner's testing agency to determine in-place quantities of undisturbed material for changes in the Work relating to soil removal, hauling, disposal and/or placement. Loose, truck, or disturbed material measurements are not acceptable. Claims for quantities not verified by the testing agency are subject to rejection by the Owner.
 - 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 changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - a. Excavation Related Changes: Contractor shall coordinate with Owner's testing agency to determine in-place quantities of undisturbed material for changes in the Work relating to soil removal, hauling, disposal and/or placement. Loose, truck, or disturbed material measurements are not acceptable. Claims for quantities not verified by the testing agency are subject to rejection by the Owner.
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 Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use form provided by Owner.

1.4 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Construction Manager will issue an Owner provided Change Order for signatures of Owner and Contractor.
- B. In order to facilitate checking of quotations for extras or credits, proposals shall be accompanied by a complete itemization of costs including labor, materials, and subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are subcontracts, they shall be itemized also. In no case will a change be approved without such itemization.
- C. Refer to CM General Conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 2. Submit the schedule of values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Arrange schedule of values consistent with format of AIA Document G703.
 3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Change Orders (numbers) that affect value.
 - e. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. List labor, materials, equipment on subcontractor statement of values backup.
 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.
 - a. Include separate line items under Contractor and principal subcontracts for project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
10. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is 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.
 1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders issued before last day of construction period covered by application.
 4. Provide Sales and Use Tax Report with each Application for Payment.
- E. Stored Materials: The Owner will pay stored materials based on contract terms.
- F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include required attachments if any.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Products list (preliminary if not final).
 5. Schedule of unit prices.
 6. Submittal schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire Owner's insurance.
- H. Subsequent Applications for Payment: After issuing the Initial Application for Payment, administrative actions and submittals that must precede or coincide with submittal of remaining Applications for Payment include the following:
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements, including submittal of record Documents.
 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. AIA Document G715, "Supplemental Attachment" to Accord Certificate of Insurance 255.
 8. Evidence that claims have been settled.
 9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 10. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Administrative and supervisory personnel.
 - 3. Coordination drawings.
 - 4. Requests for Information (RFIs).
 - 5. Project meetings.

- B. Related Sections:
 - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information from each other during construction.

1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.

- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.

7. Startup and adjustment of systems.
8. Project closeout activities.

1.4 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Provide coordination drawings in accordance with the following requirements:
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - e. Indicate required installation sequences.
 - f. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 2. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Architect determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Architect will so inform the Contractor, who shall make changes as directed and resubmit.
 3. Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Section 013300 "Submittal Procedures."
- B. Coordination Digital Data Files: Prepare coordination digital data files in accordance with the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as the original Drawings.
 2. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
 3. Architect will furnish Contractor one set of digital data files of the Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to the Drawings.
 - b. Contractor shall execute a data licensing agreement in the form of Agreement included in this Project Manual.

1.5 KEY PERSONNEL

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

1. Include the names of the following inspectors as applicable, in accordance with schedule of inspections list and personnel approved by Owner and Authorities Having Jurisdiction:
 - a. Independent building inspectors
 - b. Special Inspectors
2. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.6 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 in the WCPSS RFI System.
 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following subject to compatibility with WCPSS RFI platform:
 1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect and Construction Manager.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow five working days for Architect's response for each RFI. RFIs received by Architect or Construction Manager after 1:00 p.m. will be considered as received the following working day.
 1. The following 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.

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- 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 Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 10 days of receipt of the RFI response.
 - D. RFI Log: Utilizing WCPSS Contract Manager Software, Construction Manager will prepare and maintain a tabular log of RFIs organized by the RFI number. RFI Log will be distributed at monthly progress meetings.
 - E. On receipt of Architect's and Construction Manager's action, immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
- 1.7 WEB-BASED PROJECT INFORMATION MANAGEMENT SYSTEM
- A. The Owner has established a web-based Primavera Contract Manager Project Information Management System to facilitate communication and record-keeping during the project. The Owner will provide access to Contractor's key personnel.

Use Owner's web-based Project Information Management System for purposes of managing project communication and documentation until Final Completion.

 - 1. Due to the size restrictions on email communication, all electronic files must be submitted through Primavera. Owner and Architect assume no responsibility for information not received by Contractor's failure to use Primavera and such loss or delay of information will not be considered as a delay claim.
 - B. Project Information Management System shall include the following functions:

Project directory.

 - 1. Project correspondence.
 - 2. Meeting minutes.
 - 3. Contract modifications forms and logs.
 - 4. RFI forms and logs.
 - 5. Submittals forms and logs.
 - 6. Reminder and tracking functions.
 - 7. Task and issue management.
 - 8. Photo documentation.
 - 9. Schedule and calendar management.
 - 10. Payment application forms.
 - 11. Drawing and specification document hosting, viewing, and updating.
 - 12. Online document collaboration.
 - 13. Archiving functions.
- 1.8 PROJECT MEETINGS
- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - 1. The Superintendent shall represent the Contractor at Project Meetings.

2. Attendees: Inform participants and others involved, including inspectors, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 3. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 4. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager and Architect, within three days of the meeting.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner, Construction Manager and Architect, but no later than 15 days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, Construction Manager, 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. Use of the premises.
 - m. Work restrictions.
 - n. Working hours.
 - o. Owner's occupancy requirements.
 - p. Responsibility for temporary facilities and controls.
 - q. Parking availability.
 - r. Office, work, and storage areas.
 - s. Equipment deliveries and priorities.
 - t. Security Program and First Aid.
 4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect 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.

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- g. Submittals.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written recommendations.
 - m. Temporary facilities and controls.
 - n. Space and access limitations.
 - o. Regulations of authorities having jurisdiction.
 - p. Testing and inspecting requirements.
 - q. Installation procedures.
 - r. Coordination with other work.
 - s. Required performance results.
 - t. Protection of adjacent work.
 - u. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a Project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing operations and maintenance data.
 - e. Requirements for demonstration and training.
 - f. Preparation of Contractor's punch list.
 - g. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - h. Submittal procedures.
 - i. Owner's partial occupancy requirements.
 - j. Installation of Owner's furniture, fixtures, and equipment.
 - k. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at weekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Architect, each contractor 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) Status of submittals.
 - 4) Deliveries.
 - 5) Access.
 - 6) Site utilization.
 - 7) Temporary facilities and controls.
 - 8) Progress cleaning.
 - 9) Quality and work standards.
 - 10) Status of correction of deficient items.
 - 11) Field observations.
 - 12) Status of RFIs.
 - 13) Status of proposal requests.
 - 14) Pending changes.
 - 15) Status of Change Orders.
 - 16) Pending claims and disputes.
 - 17) 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

- A. 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.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
1. PDF electronic file.
 2. Digital .XER file.
- B. Preliminary construction schedule.
- C. Preliminary Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 3. Total Float Report: List of all activities sorted in ascending order of total float.

4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- F. Daily Construction Reports: Submit at weekly intervals.
- G. Field Condition Reports: Submit at time of discovery of differing conditions.
- H. Special Reports: Submit at time of unusual event.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice of Award to date of final completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 1. Activity Duration: Define activities so no activity is longer than 30 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for 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 Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 4. Startup and Testing Time: Include not less than 14 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include not more than the days indicated in the Agreement for punch list and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 1. Phasing: Arrange list of activities on schedule by phase.
 2. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 3. 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.

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- d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
4. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered RFIs.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
- F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- G. Computer Scheduling Software: Prepare schedules using Primavera P6 or latest edition.
- 2.2 PRELIMINARY CONSTRUCTION SCHEDULE
- A. Bar-Chart Schedule: Submit start-up horizontal bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.
 - B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- 2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)
- A. General: Prepare network diagrams using AON (activity-on-node) format.
 - B. Start-up Network Diagram: Submit diagram within 7 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

- C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to correlate with Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the start-up network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing.
 - j. Punch list and final completion.
 - k. Activities occurring following final completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.

8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (refer to special reports).
10. Stoppages, delays, shortages, and losses.
11. Emergency procedures.
12. Orders and requests of authorities having jurisdiction.
13. Services connected and disconnected.
14. Partial completions and occupancies.
15. Substantial Completions authorized.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

- B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Periodic construction photographs, including weekly photographs.
 - 3. Final completion construction photographs.

- B. Related Sections:
 - 1. Section 013300 "Submittal Procedures" for submitting photographic documentation.
 - 2. Section 017700 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
 - 3. Section 311000 "Site Clearing" for photographic documentation before site clearing operations commence.

1.2 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

- B. Digital Photographs: Submit image files within three days of taking photographs.
 - 1. Digital Camera: Minimum sensor resolution of 8 megapixels.
 - 2. Format: Maximum 2 MB per photo, Minimum 1600 by 1200 pixels, dpi minimum, 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. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - g. Unique sequential identifier keyed to accompanying key plan.

1.3 COORDINATION

- A. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities, including temporary lighting required to produce clear, well-lit photographs.

1.4 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 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 1600 by 1200 pixels and 400 dpi.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. 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.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
1. Date and Time: Include date and time in file name for each image.
 2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.
- C. Preconstruction Photographs: Before commencement of demolition, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
1. Flag construction limits before taking construction photographs.
 2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
 3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Periodic Construction Photographs:
1. Weekly: Provide a weekly photographic report with narratives for work completed to date.
 2. Monthly: Take 20 photographs monthly. Select vantage points to show status of construction and progress since last photographs were taken.
- E. Architect-Directed Construction Photographs: From time to time, Architect will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.
- F. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.
1. Three days' notice will be given, where feasible.
 2. In emergency situations, take additional photographs within 24 hours of request.
 3. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Special events planned at Project site.

- b. Immediate follow-up when on-site events result in construction damage or losses.
- c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
- d. Substantial Completion of a major phase or component of the Work.
- e. Extra record photographs at time of final acceptance.
- f. Owner's request for special publicity photographs.

END OF SECTION 013233

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SECTION 013300 - SUBMITTAL PROCEDURES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

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- a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's and Construction Manger's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.
- B. Closeout Submittal List: Submit a list of warranties, operation and maintenance manuals, and other closeout documents, arranged in Division/Section order as listed in the Project Manual.
1. Provide Table of Contents for Project Close Out document to the Architect for review, within 90 days of Notice to Proceed.
- 1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS
- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
1. Upon request, Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in Revit.
 2. The digital data files are available under the following conditions:
 - a. Contractor shall execute a data licensing agreement in the form of Digital Data Letter of Agreement included in Project Manual.
 - b. Digital data drawings are not to be considered Contract Documents as defined by the General Conditions for the Contract for Construction.
 - c. The Contract Documents executed or identified in the Owner/Contractor Agreement, shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic operations involving computers.
 - d. The Contractor shall not transfer or reuse Instruments of Service in electronic or machine-readable form without the prior written consent of the Architect.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. 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 and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Construction Manager, through Architect, before being returned to Contractor.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 4. Transmittal Form for Electronic Submittals: Use software-generated form from Owner's Primavera Contract Manager Project Information Management System.
 5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect and Construction Manager on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- H. 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.

- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 1. Post electronic submittals as PDF electronic files directly to Project Information Management System specifically established for Project.
 - a. Architect will annotate file and return when review is complete.
 2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- 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 based on Architect's digital data drawing files is otherwise permitted.
 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

- a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
2. Sheet Size: To the maximum extent possible, consistent with requirements for scale, submit Shop Drawings on sheets 8 1/2 by 11 inches or 11 by 17 inches.
 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
- 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 applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will return submittal with options selected.
 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect and Construction Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

- 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
 5. Submit product schedule in the following format:
 - a. PDF electronic file.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
 2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.
- U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S AND CONSTRUCTION MANAGER'S ACTION

- A. Action Submittals: Architect and Construction Manager will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect and Construction Manager.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

DIGITAL DATA LETTER OF AGREEMENT

An Agreement between LS3P ASSOCIATES LTD. (the "Architect") and ___ (the "Licensee," either Original or Third Party, as the case may be) for Licensing of Digital Data

Architect: LS3P ASSOCIATES LTD.
434 Fayetteville Street, Suite 1700
Raleigh, NC 27601
Contact: Mary Brehler

Licensee:
Original ___
3rd Party ___

Project No.: 8201-207411
Project Name: Swift Creek Elementary School
Location: Raleigh, NC
Date: _____

The Architect will provide the following Digital Data, dated as of the particular transmission, to the Licensee **for information purposes only:**

Sheet XXX (.dwg format)
Sheet XXX (.dwg format)
Sheet XXX (.dwg format)
Sheet XXX (.dwg format)

Revit MODEL (Revit 20XX)

Digital Data was prepared using the following:

Software: Revit (.rvt) **Version:**

Digital Data to be delivered via the following media: Newforma Website posting

Licensee shall pay the Architect a service fee of \$0.00 and other good and valuable consideration.

TERMS AND CONDITIONS

1. The Architect and its consultants make no representation as to the compatibility of the Digital Data with any hardware or software. The Licensee shall notify the Architect within five (5) business days of any problems associated with accessing and/or using the Digital Data.
2. The Licensee acknowledges and agrees that the Digital Data may change or degrade during the transmission process. The Licensee acknowledges and agrees that the Architect and its consultants may remove all indications of ownership from the Digital Data prior to transmission.
3. All Digital Data shall be considered the property of the Architect and/or its consultants and shall not be used for other Projects, for additions to this Project without the prior written permission of the Architect and/or its consultants. Digital Data shall not be re-transmitted by the Original Licensee to a Third-Party Licensee without prior execution of an agreement identical to this Agreement between the Architect, the Original Licensee, and the Third-Party Licensee. Under no circumstances shall the transmission of the Digital Data be considered a sale of goods or a sale of copyrights.

4. **THE ARCHITECT AND THE ARCHITECT'S CONSULTANTS HEREBY EXPRESSLY DISCLAIM ANY AND ALL WARRANTIES, BOTH EXPRESS AND IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AS WELL AS ANY WARRANTY OF ACCURACY, COMPLETENESS, AND/OR PERMANENCE. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.** Addenda information and/or revisions made to the most current Digital Data after any date of transmission have not been incorporated into the transmitted Digital Data. In the event of a conflict between the Architect's printed instruments of service (2D Documents) whether sealed or unsealed) and the Digital Data (3D Model), the printed instruments of service shall govern. The Licensee acknowledges and agrees that the duty to determine the existence of any and all conflicts between the Digital Data and any other information upon which the Licensee relies rests solely upon the Licensee. The Digital Data shall not be considered Contract Documents or Construction Documents as defined by any General Conditions of Contract for Construction. The Digital Data is being provided for information only and on a strictly "AS IS" basis.

5. Licensee agree the extent of its reliance on any Digital Data shall be limited to the uses identified in this Agreement.

6. Licensee may use and rely upon the Digital Data only for programming, site analysis, design review, 3D coordination of structural, mechanical, plumbing, and electrical systems, and preconstruction activities.

7. The Level of Development (LOD) describes the minimum dimensional, spatial, quantitative, qualitative, and other data included in the Digital Data to support the uses and reliance included in this Agreement. The LOD of the Digital Data transmitted is LOD 200. LOD 200 is defined as model and model elements that are generically and graphically represented within the Digital Data with approximate quantity of major components, size, shape, location, and orientation.

8. If Licensee discovers or becomes aware of any discrepancies, inconsistencies, errors, or omissions in any Digital Data transmitted, they shall promptly report the discrepancy, inconsistency, error, or omission in writing to the Architect. Licensee shall not use any discrepancy, inconsistency, error, or omission in the Digital Data as the basis of a claim.

9. Any reliance on the Digital Data not in accordance with this Agreement shall be at the sole risk of the Licensee.

10. The use and/or provision of the Digital Data prepared by the Architect and/or its consultants shall not in any way reduce or obviate the Licensee's duty to check and coordinate dimensions, details, and quantities of materials as required to facilitate construction of the Project in a complete and quality manner consistent with the applicable standards of care. Confirmation of existing conditions is the sole responsibility of the Licensee.

11. The Licensee agrees to the extent permitted by applicable law, to indemnify, hold harmless, and release the Architect and/or its consultants, their officers, shareholders, employees, and sub-consultants from any and all injuries, claims, demands, expenses, suits, liabilities, losses, damages, costs, disputes, other matters in question, third party claims, pass-through claims, subrogated claims, and/or claim expenses related to the Digital Data, including but not limited to, attorneys' fees, expert witness fees, and court costs arising out of or in any way related to or connected with any negligent act and/or omission in the generation, provision, and/or use of the Digital Data by the Licensee and/or any of its subcontractors, suppliers, and/or consultants and waive any and all rights to such claims and causes of action.

12. The Licensee waives damages against the Architect for any and all injuries, claims, losses, expenses, damages, disputes, other matters in question, and/or claim expenses arising out of or relating to this Agreement and/or

generation, provision, and/or use of the Digital Data, including, but not limited to, consequential damages and reasonable attorneys' fees and defense costs.

13. The Architect's and/or the Architect's consultants' liability to the Licensee and/or any of its subcontractors, suppliers, and/or consultants for any and all injuries, claims, losses, expenses, damages, disputes, other matters in question, third party claims, pass-through claims, subrogated claims, and/or claim expenses arising out of or relating to this Agreement and/or the Digital Data, including, but not limited to, reasonable attorneys' fees and defense costs, regardless of the nature of the claim or damage, shall not exceed, either individually or in the aggregate, the total amount of \$1,000.00. Such causes include, but are not limited to, the Architect's and/or the Architect's consultants' negligence, errors, omissions, strict liability, breach of contract, and/or breach of warranty.

14. To the best of the Architect's knowledge, information and belief, there are no licensing or copyright fees due to others based on the transmission of the Digital Data, but to the extent that such unknown fees do exist, the Licensee agrees to pay the required fees and hold the Architect and/or its consultants harmless from any associated costs or penalties.

15. Upon execution of this Agreement, the Architect grants to the Licensee a non-exclusive, non-transferable (except as set forth herein), limited license to use the Digital Data solely and exclusively for informational purposes on the identified Project only, provided that the Licensee substantially performs its obligations under this Agreement.

16. Any purchase order number provided by the Licensee is for the Licensee's accounting purposes only. The Licensee acknowledges and agrees that purchase order terms and conditions are null, void, and inapplicable to this Agreement.

17. This Agreement constitutes the entire agreement between the parties relative to the Digital Data and shall be governed by the laws of the State of North Carolina without regard to principles of conflicts of law.

AUTHORIZED ACCEPTANCE

by Architect:
LS3P ASSOCIATES LTD.

by Original Licensee:

Signature

Signature

Print Name and Title

Print Name and Title

Date

Date

by Third Party Licensee:

Signature

Print Name and Title

Date

WE SO CONSENT:

by Owner:

Signature

Print Name and Title

Date

SECTION 014000 - QUALITY REQUIREMENTS**PART 1 - GENERAL****1.1 SUMMARY**

- A. 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, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections:
 - 1. Section 013200 "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on the project site, consisting of multiple products, assemblies and subassemblies.
 - 2. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
- D. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

- E. 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 specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. 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. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.5 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Contractor's Quality-Control Manager Qualifications: For supervisory personnel.

- C. Testing Agency Qualifications: 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.
- D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
 2. Entity responsible for performing tests and inspections.
 3. Description of test and inspection.
 4. Identification of applicable standards.
 5. Identification of test and inspection methods.
 6. Number of tests and inspections required.
 7. Time schedule or time span for tests and inspections.
 8. Requirements for obtaining samples.
 9. Unique characteristics of each quality-control service.
- E. 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 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: Include in quality-control plan a comprehensive schedule of Work requiring testing or inspection, including the following:
1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. 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.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical 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.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

1.8 QUALITY ASSURANCE

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

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- C. 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.
- D. 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.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, mockups; do not reuse products on Project.
 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
 2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Demolish and remove mockups when directed, unless otherwise indicated.
- L. In-Place Mockups: Before installing portions of the Work requiring in-place mockups, build mockups indicated for each form of construction and finish indicated, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
 2. Notify Architect, through Construction Manager, seven days in advance of dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Perform field-testing as indicated on in-place mockups to verify compliance with requirements.
 5. Obtain Architect's and Owner's approval of mockups before continuing work or installation.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Approved mockups may be incorporated into the Work.
- M. Room Mockups: Construct room mockups incorporating required materials and assemblies, finished in accordance with requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work.
1. Provide room mockups of the following rooms:
 - a. Select room(s), in consultation with Architect, to serve as project mockup for typical finishes and components. This room shall include floor, wall and ceiling finishes and the installation of the following components:
 - 1) Marker Boards
 - 2) Casework
 2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 3. Approved mockups may be incorporated into the Work.
- N. Composite Exterior Wall Mockup: Before ordering materials or commencing elements of the Work noted as part of the Exterior Wall Mockup, build mockup for approval of exterior materials and finishes.
1. The mockup is shown on the Drawings and includes, but is not limited to, the following materials:
 - a. Precast Concrete.
 - b. Masonry, including masonry reinforcing.
 - c. Sheathing.

- d. Metal wall panels.
 - e. Fiber-cement siding.
 - f. Pre-finished aluminum.
 - g. Aluminum-framed entrances and storefront.
 - h. Glazed aluminum curtainwall.
 - i. Glass.
 - j. Sealants.
 - k. Waterproofing.
 - l. Air barrier.
 - m. Insulation.
 - n. Flashing.
2. Schedule: Allow time for the construction of the mockup, review by Architect, Owner and Construction Manager.
 3. Submittal: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, finish and color designations, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 4. Notify Architect through Construction Manager seven days in advance of dates and times when mockups will be constructed.
 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 6. Obtain Architect's and Owner's approval of mockups before starting work, fabrication, or construction.
 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 8. Demolish and remove mockups when directed, unless otherwise indicated.

1.9 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 from testing and inspecting allowances, as authorized by Change Orders.
 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 Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. 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.
 2. 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.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

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5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. **Manufacturer's Technical Services:** Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. **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.
- F. **Testing Agency Responsibilities:** Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Construction Manager, 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.
- G. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. **Schedule of Tests and Inspections:** Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of the Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.10 SPECIAL TESTS AND INSPECTIONS

- A. Statement of Responsibility: Prior to commencement of work on the system or component, each contractor responsible for the construction of main wind- or seismic-resisting system listed in the Statement of Special Inspections shall submit a written statement of responsibility to the Authority Having Jurisdiction and to the Owner indicating acceptance of responsibility for the construction of systems or components in accordance with the Contract Documents.
- B. The Contractor's Statement of Responsibility shall include the following:
 1. Acknowledgment that Contractor has read the Statement of Special Inspections and has correlated its requirements with the Drawings and Specifications.
 2. Acknowledgement that construction of main wind- or seismic-resisting system includes special requirements as contained in the Statement of Special Inspections.
 3. Acknowledgement that control will be exercised to obtain conformance with the Construction Documents approved by the Authority Having Jurisdiction.
 4. Procedures for exercising control within the Contractor's organization, the methods and frequency of reporting and the distribution of reports.
 5. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
 6. Form of Statement: Case (Council of American Structural Engineers) Form 103.
- C. Special Tests and Inspections: Owner will engage a qualified testing agency and special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections attached to this Section, and as follows:
 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

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

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

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017000 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014100 - SPECIAL INSPECTION SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Special Inspection services.
- B. Certain structural components of the Project will be subject to the requirements for Special Inspections. Special Inspections will be applicable to the following specification sections:
 - 1. Section 033000 Building Cast-In-Place Concrete
 - 2. Section 042000 Unit Masonry
 - 3. Section 051200 Structural Steel Framing
 - 4. Section 052100 Steel Joist Framing
 - 5. Section 053100 Steel Decking
 - 6. Section 054000 Cold-Formed Metal Framing
 - 7. Section 312000 Earth Moving
 - 8. Section 316100 Aggregate Piers
- C. The Owner will procure and bear all costs of the Special Inspector and the Independent Testing Agencies, except as otherwise noted. The Special Inspector will be the manager of the Special Inspection process. The Special Inspector checks the certification of all other inspecting agents required by Special Inspections and coordinates their activities. The Special Inspector carries the exclusive responsibility for assuring that the inspections indicated are performed. The Statement of Special Inspections will be required by the Building Official as a condition for building permit issuance.
- D. Requirements for Special Inspections are outlined in the Statement and Schedule of Special Inspections included at the end of this section.
 - 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, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
- E. Special Inspections are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
- F. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Quality Control" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.

1.3 RESPONSIBILITIES

- A. Contractor Responsibilities: Contractor shall provide and include in the Contract Sum, inspections, tests, and other similar quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction except where they are specifically indicated to be the Owner's responsibility, or are provided by another identified entity.
1. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.
 - a. The Contractor shall correct deficiencies in work that inspections and laboratory test reports have indicated to be not in compliance with requirements.
 - b. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.
 2. 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.
 - a. 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. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
 - a. Provide access to the Work.
 - b. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
 - c. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
 - d. Provide and maintain for the sole use of the Special Inspector or Special Inspectors adequate facilities for safe storage and proper curing of test samples on the Project Site.
 - e. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
 - f. Provide security and protection of samples and test equipment at the Project Site.
 - g. The Contractor shall designate a representative (the superintendent or an assistant to the superintendent) who shall be the direct point-of-contact with the Special Inspector during each phase of the work. Discrepancies noted during the progress of the work will be reported to the Contractor's representative for corrective action. Communications given by the Special Inspector to the Contractor's representative shall be as binding as if given to the Contractor.
- B. Special Inspector Responsibilities:
1. The Special Inspector shall conduct and interpret tests, state in each report whether test specimens comply with requirements, specifically state any deviations therefrom, and record work required and performed to correct deficiencies.
 2. The Special Inspector will keep records of all inspection and tests which will be furnished to the Building Official, the Architect, and the Structural Engineer of Record.

3. The Special Inspector shall notify the Architect, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services. All discrepancies will be brought to the immediate attention of the Contractor for correction. If discrepancies are not corrected, the discrepancies will be brought to the attention of the Building Official and the Structural Engineer of Record.
 4. A final report documenting completion of all required special inspections and corrections of any discrepancies noted will be submitted to the Building Official by the Special Inspector prior to, and as a condition of, issuance of the Certificate of Use and Occupancy.
 5. The Special Inspector shall not perform any duties of the Contractor
 6. The Special Inspector shall not release, revoke, alter, decrease or increase the Contract Document requirements.
- C. Independent Testing Agency Responsibilities: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
1. Notify Architect, Construction Manager, 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. Shall not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
- D. Coordination: The Contractor and each agency engaged to perform inspection, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
- 1.4 SUBMITTALS
- A. The Special Inspector and the Independent Testing Agencies shall submit a certified written report of each inspection, test, or similar service to the Architect.
1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
 2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making the inspection or test.
 - f. Designation of the Work and test method.
 - g. Identification of product and Specification Section.
 - h. Complete inspection or test data.
 - i. Test results and an interpretation of test results.

- j. Ambient conditions at the time of sample taking and testing.
- k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
- l. Name and signature of laboratory inspector.
- m. Recommendations on retesting.

1.5 QUALITY ASSURANCE

- A. Qualification for Special Inspector: The Special Inspector shall be a Registered Professional Engineer, Licensed in the State of North Carolina, experienced in performing special inspections and shall be approved by the Building Official and the Architect. The credentials of all Inspectors and testing technicians shall be provided if requested.
- B. Qualifications for Independent Testing Agencies: Engage independent inspection and testing agencies, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.
 - 1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.
 - 2. Each independent inspection and testing agency engaged on the Project shall demonstrate that it has the experience and capability to conduct the required field and laboratory testing without delaying the progress of the work. The minimum requirements shall be as follows:
 - a. Reinforced Concrete Testing – ACI-CFTT, ACI-STT, ACI-LTT, NICET-CT
 - b. Reinforced Concrete Inspection – ACI-CCI, ICC-RCSI
 - c. Welding – AWS-CWI
 - d. Non-Destructive Testing - ASNT
 - e. Structural Masonry – ICC-SMSI
 - f. Structural Steel and Welding – ICC-SWSI, AWS/AISC-SSI
 - g. Soils Testing – NICET-ST, NICET-GET

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

- C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 014100

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Statement of Special Inspections

Project: *Swift Creek Elementary School*

Location: *Raleigh, North Carolina*

Owner: *Wake County Public School System*

Design Professional in Responsible Charge: *Jeffrey R. Morrison, PE*

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

- Structural
- Mechanical/Electrical/Plumbing
- Architectural
- Other: _____

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

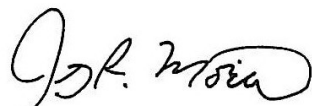
A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

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

Interim Report Frequency: *Monthly* or per attached schedule.

Prepared by:

Jeffrey R. Morrison, PE
(type or print name)



Signature

04/05/2024

Date



Owner's Authorization:

Building Official's Acceptance:

Signature

Date

Signature

Date

Schedule of Special Inspections

This Schedule of Special Inspections includes the following building systems:

- | | |
|---|--|
| <input checked="" type="checkbox"/> Soils and Foundations | <input type="checkbox"/> Spray Fire Resistant Material |
| <input checked="" type="checkbox"/> Cast-in-Place Concrete | <input type="checkbox"/> Wood Construction |
| <input type="checkbox"/> Precast Concrete | <input type="checkbox"/> Exterior Insulation and Finish System |
| <input checked="" type="checkbox"/> Masonry | <input type="checkbox"/> Mechanical & Electrical Systems |
| <input checked="" type="checkbox"/> Structural Steel | <input type="checkbox"/> Architectural Systems |
| <input checked="" type="checkbox"/> Cold-Formed Metal Framing | <input type="checkbox"/> Special Cases |

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. Special Inspector		
2. Geotechnical Testing Agency		
3. Construction Materials Testing Agency		

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official. The credentials of all Inspectors and testing technicians shall be provided if requested.

Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agency Number* on the Schedule.

PE/SE	Structural Engineer – a licensed SE or PE specializing in the design of building structures
PE/GE	Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

American Concrete Institute (ACI) Certification

ACI-CFTT	Concrete Field Testing Technician – Grade 1
ACI-CCI	Concrete Construction Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2
ACI-STT	Strength Testing Technician

American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector
AWS/AISC-SSI	Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT	Non-Destructive Testing Technician – Level II or III.
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International Code Council (ICC) Certification

ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

Exterior Design Institute (EDI) Certification

EDI-EIFS	EIFS Third Party Inspector
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Soils and Foundations

Item	Agency # (Qualif.)	Scope
1. Subgrade Preparation	2 PE/GE	<p><i>Periodically observe that all vegetation, topsoil, uncompacted fill, debris and portions of previous building foundations and structures have been completely stripped and removed from building pad.</i></p> <p><i>Continuously observe proof rolling of prepared subgrade and provide direction for removal and replacement of any unsuitable soils.</i></p>
2. Controlled Structural Fill	2 PE/GE	<p><i>Periodically perform classification and testing of compacted fill materials.</i></p> <p><i>Continuously verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.</i></p>
3. Shallow Foundations	2 PE/GE	<p><i>Periodically verify materials below shallow foundations are adequate to achieve the design bearing capacity.</i></p> <p><i>Periodically verify excavations are extended to proper depth and have reached proper material.</i></p>

Cast-in-Place Concrete

Item	Agency # (Qualif.)	Scope
1. Mix Design	3 ACI-CCI ICC-RCSI	<i>Continuously review concrete batch tickets and verify compliance with approved mix design. Verify that water added at the site does not exceed that allowed by the mix design.</i>
2. Reinforcement Installation	1 & 3 ACI-CCI ICC-RCSI	<i>Periodically inspect size, spacing, cover, positioning and grade of reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters</i>
3. Anchor Rods	1 & 3 ACI-CCI ICC-RCSI	<i>Periodically inspect size, positioning and embedment of anchor rods. Inspect concrete placement and consolidation around anchors.</i>
4. Concrete Placement	3 ACI-CCI ICC-RCSI	<i>Continuously inspect placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.</i>
5. Sampling and Testing of Concrete	3 ACI-CFTT ACI-STT	<i>Periodically test concrete compressive strength, slump, air-content, unit-weight and temperature.</i>
6. Curing and Protection	3 ACI-CCI ICC-RCSI	<i>Periodically inspect curing, cold weather protection and hot weather protection procedures.</i>

Masonry

Required Inspection Level: 1 2

Item	Agency # (Qualif.)	Scope
1. Mixing of Mortar and Grout	3 ICC-SMSI	<i>Periodically inspect proportioning, mixing and retempering of mortar and grout.</i>
2. Installation of Masonry	1 & 3 ICC-SMSI	<i>Periodically inspect size, layout, bonding and placement of masonry units.</i>
3. Mortar Joints	1 & 3 ICC-SMSI	<i>Periodically inspect construction of mortar joints including tooling and filling of head joints.</i>
4. Reinforcement Installation	1 & 3 ICC-SMSI	<i>Periodically inspect placement, positioning and lapping of reinforcing steel.</i>
5. Grouting Operations	3 ICC-SMSI	<i>Continuously inspect placement and consolidation of grout. Inspect masonry clean-outs for high-lift grouting.</i>
6. Weather Protection	3 ICC-SMSI	<i>Periodically inspect cold weather protection and hot weather protection procedures. Verify that wall cavities are protected against precipitation.</i>
7. Evaluation of Masonry Strength	3 ICC-SMSI	<i>Periodically test compressive strength of mortar and grout specimens.</i>
8. Anchors and Ties	1 & 3 ICC-SMSI	<i>Periodically inspect size, location, spacing and embedment of dowels, anchors and ties.</i>

Structural Steel

Item	Agency # (Qualif.)	Scope
1. Fabricator Certification/ Quality Control Procedures <input checked="" type="checkbox"/> Fabricator Exempt	1 AWS/AISC- SSI ICC-SWSI	Review shop fabrication and quality control procedures.
2. Material Verification	3 AWS/AISC- SSI ICC-SWSI	Periodically review certified mill test reports and identification markings on structural shapes, high-strength bolts, nuts, washers and welding electrodes
3. Open Web Steel Joists	1 & 3 AWS/AISC- SSI ICC-SWSI	Periodically inspect installation, field welding and bridging of joists.
4. Bolting	3 AWS/AISC- SSI ICC-SWSI	Periodically inspect installation and tightening of high-strength bolts. Verify that splines have separated from tension control bolts. Verify proper tightening sequence.
5. Welding	3 AWS-CWI ASNT	Periodically visually inspect all fillet welds < 5/16". Verify size and length of fillet welds. Continuously visually inspect all complete and partial joint penetration groove welds, multi-pass fillet welds and single pass fillet welds > 5/16". Perform ultrasonic testing on a minimum of 25 percent of all complete joint penetration welds.
6. Shear Connectors	3 AWS/AISC- SSI ICC-SWSI	Periodically inspect size, number, positioning and welding of shear connectors. Inspect studs for full 360 degree flash. Ring test all shear connectors with a 3 lb hammer. Bend test all questionable studs to 15 degrees.
7. Structural Details	1 & 3 PE/SE	Periodically inspect steel frame for compliance with structural drawings, including bracing, member configuration and connection details.
8. Metal Deck	3 AWS-CWI	Periodically inspect welding and side-lap fastening of metal roof and floor deck.

Cold-Formed Metal Framing

Item	Agency # (Qualif.)	Scope
1. Member Sizes and Connections	1 PE/SE	<i>Periodically inspect member sizes, gage, spacing and locations and connection details for compliance with approved shop drawings.</i>
2. Mechanical Fasteners	1 PE/SE	<i>Periodically verify correct size, quantity, spacing and thread engagement at screw fastened connections. Periodically verify correct type, spacing, size and embedment at powder actuated fasteners and foundation anchors.</i>
3. Framing Details	1 PE/SE	<i>Periodically verify installed work complies with framing details on the approved shop drawings.</i>

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "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.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. 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.

1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
1. ICC - International Code Council; www.iccsafe.org.
 2. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.
- B. Temporary utilities include, but are not limited to, the following:
 - 1. Sewers and drainage.
 - 2. Water service and distribution.
 - 3. Sanitary facilities, including toilets, wash facilities, drinking-water facilities, and lavatories as required by OSHA 1926.51(f)(3).
 - 4. Heating and cooling facilities.
 - 5. Ventilation.
 - 6. Electric power service.
 - 7. Lighting.
 - 8. Telephone service.
 - 9. Wireless connectivity
- C. Support facilities include, but are not limited to, the following:
 - 1. Temporary roads and paving.
 - 2. Dewatering facilities and drains.
 - 3. Project identification and temporary signs.
 - 4. Waste disposal facilities.
 - 5. Field offices.
 - 6. Storage and fabrication sheds.
 - 7. Lifts and hoists.
 - 8. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities include, but are not limited to, the following: Comply with IBC Ch. 33; IFC Ch. 33; IEFC Ch.15; IBC T.602; T.1018.1 & 1018.2; OSHA 1910.36(a)(2)
 - 1. Environmental protection.
 - 2. Stormwater control.
 - 3. Tree and plant protection.
 - 4. Pest control.
 - 5. Site enclosure fence.
 - 6. Security enclosure and lockup.
 - 7. Barricades, warning signs, and lights.
 - 8. Covered walkways.
 - 9. Temporary enclosures.
 - 10. Temporary partitions.
 - 11. Fire protection.

1.2 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

- A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be calculated as indicated in WCPSS/CM contract. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
1. Owner's construction forces.
 2. Occupants of Project.
 3. Construction Manager.
 4. Architect.
 5. Testing agencies.
 6. Personnel of authorities having jurisdiction.
- B. Sewer Service: Pay sewer service use charges for sewer usage, by all parties engaged in construction, at Project site.
- C. Water Service: Pay water service use charges, whether metered or otherwise, for water used by all entities engaged in construction activities at Project site.
- D. Electric Power Service: Pay electric power service use charges, whether metered or otherwise, for electricity used by all entities engaged in construction activities at Project site.

1.4 SUBMITTALS

- A. Temporary Utility Reports: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.
- B. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- C. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- E. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

1.5 QUALITY ASSURANCE

- A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
 2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

- A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.
 - 1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
- B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
 - 1. Keep temporary services and facilities clean and neat.
 - 2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.
- B. Pavement: Comply with Section 321216 "Asphalt Paving."
- C. Portable Chain-Link Fencing: Minimum 2-inch 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized steel bases for supporting posts.
- D. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.
- E. Water: Potable.

2.2 EQUIPMENT

- A. General: Provide equipment suitable for use intended.
- B. Field Offices: Mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading.
 - 1. Size of mobile unit: Minimum 12'x60' with meeting room.
 - 2. Tables and Chairs for meeting room: 2 tables and 12 Chairs.
- C. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

- D. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
 - 1. Provide lavatories as required by OSHA 1926.51(f)(3).
- E. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.
- F. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.
- G. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.
- H. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.1 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.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 SITE USE PLAN

- A. Contractor shall confine operations within the areas indicated and as shown on the site use plan and as permitted by law, ordinances, and permits. Site shall not be unreasonably encumbered with materials, products, or construction equipment.
- B. The Contractor in reviewing the use of the site shall include access to proposed building for construction purposes, parking where possible for employees, temporary facilities including offices, storage, and workshop sheds or portable trailers, utility hookups, staging areas, storage materials and products, and unloading space.
- C. The Contractor shall show additional area needed in the Contractor's use of the site beyond that which may be indicated on the Drawings. Where additional fencing is required, such fencing shall be included at no additional cost to the Owner.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
 2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
 3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.
- B. Storm Sewers and Storm Drainage: If storm sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If storm sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither storm sewers nor storm drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.
- Connect temporary storm sewers to municipal system as directed by authorities having jurisdiction.
1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog storm sewers or pollute waterways before discharge.
 2. Maintain temporary storm sewers and storm drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction until permanent water service is in use. Sterilize temporary water piping before use.
1. Provide rubber hoses as necessary to serve Project site.
 2. As soon as water is required at each level, extend service to form a temporary water- and fire-protection standpipe. Provide distribution piping. Space outlets so water can be reached with a 100-foot hose. Provide one hose at each outlet.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
 2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.
 - a. Provide safety showers, eyewash fountains, lavatory/hand wash sink and similar facilities where required by authorities having jurisdiction.
 3. Drinking-Water Facilities: Provide bottled-water, drinking-water units.
- 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 from that specified that will not have a harmful effect on completed installations or elements being installed.
1. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.
- 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 from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

- G. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.
1. Install electric power service underground, unless overhead service must be used.
 2. Install power distribution wiring overhead and rise vertically where least exposed to damage.
 3. Connect temporary service to Owner's existing power source, as directed by electric company officials.
- H. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.
1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 2. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.
- J. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities. Install separate telephone line for each field office and first-aid station.
1. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
 2. Provide superintendent with a cellular telephone or portable 2-way radio when away from field office.
- K. Electronic Communication Service: Provide wireless connectivity in the primary field office adequate for use by Architect, Owner and project team's wireless devices to access project electronic documents and maintain electronic communications.

3.4 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
 2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.

3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate to support loads and to withstand exposure to traffic during construction period. Locate temporary roads and paved areas in same location as permanent roads and paved areas. 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 "Earthwork."
 3. 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."
- C. Dewatering Facilities and Drains: Comply with requirements in applicable Division 31 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.
 2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
 3. Remove snow and ice as required to minimize accumulations.
- D. Project Identification and Temporary Signs: Prepare Project identification as instructed by Architect. Install signs to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.
1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details attached at the end of this Section.
 2. Prepare temporary signs to provide directional information to construction personnel and visitors.
 3. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood unless indicated otherwise, and in sizes and thicknesses indicated. Support on posts and framing of preservative-treated wood.
 4. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.
 5. Location of project identification sign as directed by Architect.
- E. Directional Signage: Mount directional signage on pressure treated wood or galvanized steel posts and framing.
- F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Section 017300 "Execution" for progress cleaning requirements.
1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
 2. Waste Disposal: Do not burn waste materials. Burning on the project site is not permitted. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully. Comply with regulations of authorities having jurisdiction.
- G. Janitorial Services: Provide janitorial services on a daily basis for temporary offices, first-aid stations, toilets, wash facilities, lunchrooms, and similar areas.

- H. Common-Use Field Office: Provide an insulated, weathertight, air-conditioned field office for use as a common facility by all personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 25 persons at Project site. Keep office clean and orderly.
1. Furnish and equip offices as follows:
 - a. Desk and four chairs, four-drawer file cabinet, a plan table, a plan rack, and bookcase.
 - b. Water cooler and private toilet complete with water closet, lavatory, and medicine cabinet with mirror.
 - c. Provide a room of not less than 240 sq. ft. for Project meetings. Furnish room with conference table, 12 folding chairs, and 4-foot- square tack board.
 2. Provide resilient floor covering and painted gypsum wallboard walls and acoustical ceiling. Provide operable windows with adjustable blinds and insect screens.
 3. Provide an electric heater with thermostat capable of maintaining a uniform indoor temperature of 68 deg F. Provide an air-conditioning unit capable of maintaining an indoor temperature of 72 deg F.
 4. Provide fluorescent light fixtures capable of maintaining average illumination of 20 fc at desk height. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot intervals, 1 per wall in each room.
- I. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.
- J. Lifts and Hoists: Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- K. Contractor(s) shall be responsible for protecting the site streets connecting to the project from deposits of mud, sand, stone, litter, or debris of any form. All mud collected on vehicle wheels must be cleaned off before leaving the construction area. Any mud or debris collecting on the streets from the construction project shall be removed immediately before becoming a traffic hazard or being carried into the surrounding buildings.
- L. Catch basins and storm drain lines in the vicinity of the site shall be protected from the entry of mortar, concrete to spoil, and other construction debris. The residue from the cleaning of ready-mix trucks, wheelbarrows, concrete buggies, etc. must be prevented from entering the drainage system, and if cleaning is done, it must be contained and residue removed from the site with other refuse. Comply with environmental protection requirements.
- M. Automobile parking on the site is restricted. Delivery trucks, contractor's vehicles, workmen's autos, and all other parking connected with the project must be within the project limits. No areas are available on site for those purposes outside of designated limits. Coordinate with the Owner parking availability.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.
- B. Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest-control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest-control service to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

- C. Site Enclosure Fence: Before construction operations begin, install enclosure fence with lockable entrance gates. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.
1. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.
 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.
- D. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- E. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Comply with IBC Ch. 33; IFC Ch. 33; IEFC Ch.15; IBC T.602; T.1018.1 & 1018.2; OSHA 1910.36(a)(2). Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- F. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior. Comply with IBC Ch. 33; IFC Ch. 33; IEFC Ch.15; IBC T.602; T.1018.1 & 1018.2; OSHA 1910.36(a)(2).
1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 2. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.
 3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
 4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
 5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire-retardant-treated material for framing and main sheathing.
- G. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise. Comply with IBC Ch. 33; IFC Ch. 33; IEFC Ch.15; IBC T.602; T.1018.1 & 1018.2; OSHA 1910.36(a)(2).
1. Construct dustproof partitions of not less than nominal 4-inch studs, 5/8-inch gypsum wallboard with joints taped on occupied side, and 1/2-inch fire-retardant plywood on construction side.
 2. Insulate partitions to provide noise protection to occupied areas.
 3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
 4. Protect air-handling equipment.
 5. Weatherstrip openings.
- H. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
 - a. Field Offices: Class A stored-pressure water-type extinguishers.
 - b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.

- c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
7. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- 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 the property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS**PART 1 - GENERAL****1.1 SUMMARY**

- A. 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; and comparable products.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

- A. Products: Items obtained 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. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process 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. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," 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 additional manufacturers named in the specification.

1.3 SUBMITTALS

- A. Comparable Product Requests: Comply with requirements in Section 012500 "Substitution Procedures."
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Compatibility: Contractor is responsible for providing products and construction methods compatible with other products and construction methods used on the Project.
- B. Asbestos: No asbestos or asbestos-containing material may be incorporated into the Work.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Store cementitious products and materials on elevated platforms.
 - 5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 7. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. **Manufacturer's Warranty:** Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. **Special Warranty:** Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. **Special Warranties:** Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 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 indicated form properly executed.
 - 3. See Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. **Submittal Time:** Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated 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 requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the conditions of Section 012500 "Substitution Procedures" are satisfied. If the conditions are not satisfied, Architect, through Construction Manager, may return requests without action, except to record noncompliance with these requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

Construction layout.

1. Field engineering and surveying.
2. Installation of the Work.
3. Progress cleaning.
4. Starting and adjusting.
5. Protection of installed construction.

- B. Related Requirements:

1. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. 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 copies signed by land surveyor.

1.3 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

1. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

1. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

Description of the Work.

1. List of detrimental conditions, including substrates.
2. List of unacceptable installation tolerances.
3. Recommended corrections.

- D. 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, Architect, and Owner 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 caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

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 and Construction Manager promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
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.
1. Establish limits on use of Project site.
 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
- C. Inform installers of lines and levels to which they must comply.
Check the location, level and plumb, of every major element as the Work progresses.
1. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
 2. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- D. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- E. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- F. 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 and Construction Manager.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

1. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 2. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

Make vertical work plumb and make horizontal work level.

1. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 2. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 3. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
- Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
1. Allow for building movement, including thermal expansion and contraction.
 2. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

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

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

1. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
2. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

Use containers intended for holding waste materials of type to be stored.

Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

- B. Site: Maintain Project site free of waste materials and debris.

- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

Remove liquid spills promptly.

1. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

- 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 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.8 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.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 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.

1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

1.3 PERFORMANCE REQUIREMENTS

- A. Contractor is encouraged to recycle as much nonhazardous demolition and construction waste as practical, without incurring additional costs to the Owner.

1.4 QUALITY ASSURANCE

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT AND DISPOSAL, GENERAL

- A. General: Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management during the entire duration of the Contract.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
- C. 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.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues received for recycling waste materials shall accrue to Contractor.
- 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 they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.3 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 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
1. Inspection procedures.
 2. Final clean up.

1.2 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 2. Advise Owner of pending insurance changeover requirements.
 3. Submit specific warranties, workmanship bonds, final certifications, and similar documents.
 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities.
 5. Prepare and submit Project Record Documents, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner.
 7. Submit test/adjust/balance records.
 8. Terminate and remove temporary facilities from Project site, construction tools, and similar elements.
 9. Submit changeover information related to Owner's use or other work.
 10. Complete final clean up requirements.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Inspection: Submit a written request for final inspection for acceptance. 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.

C. Survey: After final Certificate for Payment has been prepared by Architect, engage a professional engineer to prepare a final as-built topographic survey to verify quantities of stripping and stockpiled material and building pad elevations.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect and Construction Manager.
 - d. Name of Contractor.
 - e. Page number.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 FINAL CLEAN UP

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

1. Cleaning: 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.
 - a. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - b. Leave Project clean and ready for occupancy.

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

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 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 Sections:
1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 2. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.2 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.

1.3 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. Where applicable, clarify and update reviewed manual content to correspond to modifications and field conditions.
 2. In addition to content specified in individual specification sections, manuals shall include, but are not limited to, the following:
 - a. Approved submittals.
 - b. List of extra material stock and signed transmittal.
 - c. Sign-in sheets for training sessions.
 - d. Copies of permits.
 - e. Warranties.
 - f. Record drawings and specifications.
 - g. Testing and inspection reports.
 - h. Final punch list.
 - i. Asbestos-free document.
 - j. Final commissioning report.
- B. Format: Submit operations and maintenance manuals in the following format:
1. PDF electronic file. Assemble each manual into a composite electronically-indexed file. Submit on digital media acceptable to Architect.

- a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect, through Construction Manager, will return two copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Construction Manager will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
1. Correct or modify each manual to comply with Architect's and Construction Manager's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Construction Manager's comments and prior to commencing demonstration and training.

1.4 COORDINATION

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

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
1. List of documents.
 2. List of systems.
 3. List of equipment.
 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 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. Project number.
 6. Name and contact information for Contractor.
 7. Name and contact information for Construction Manager.
 8. Name and contact information for Architect.
 9. Name and contact information for Commissioning Agent.
 10. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 11. 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. Provide electronic files on USB flash drive.
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 upon 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 upon opening file.

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 is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. 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 017823

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SECTION 017839 - PROJECT RECORD DOCUMENTS**PART 1 - GENERAL****1.1 SUMMARY**

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

1.2 SUBMITTALS

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

PART 2 - PRODUCTS**2.1 RECORD DRAWINGS**

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - d. Scan completed Record Prints containing recorded changes and save data in current Windows file format required by Owner. Scanned Record Prints shall be in color. Deliver files on USB flash drive.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.

- i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record CAD Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:
1. Format: Same CAD program, version, and operating system as the original Contract Drawings.
 2. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Architect for resolution.
 4. Architect will furnish Contractor one set of CAD Drawings of the Contract Drawings for use in recording information.
 - a. Architect makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.
- C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- D. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Record CAD Drawings: Organize CAD 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 CAD file.
 3. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect and Construction Manager.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Provide an additional (*electronic* data based format in color) document individually listing each section of specifications included in the project manual and all addenda, negotiate changes and change orders.
1. Designate the manufacturer/product/supplier(s), as applicable, actually provided for each product in each section.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project. Annotate concurrently with construction progress, not less than weekly, to show actual revisions to the Work.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839

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SECTION 017900 - DEMONSTRATION AND TRAINING**PART 1 - GENERAL****1.1 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.

1.2 SUBMITTALS

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. At completion of training, submit one complete training manual(s) for Owner's use.

1.3 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. 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, 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.

1.4 COORDINATION

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

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, including but not limited to the following, and as required by individual Specification Sections.
1. Motorized doors.
 2. Kitchen equipment.
 3. Motorized roller window shades.
 4. Conveying systems.
 5. Fire-protection systems.
 6. HVAC systems.
 7. HVAC instrumentation and controls.
 8. Electrical service and distribution.
 9. Lighting equipment and controls.
 10. Communication systems and equipment.
 11. Intercom system.
 12. Entrance and access controls.
 13. Security camera system.
 14. Intrusion detection systems.
 15. ADAPT CURR appliances.
- 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:
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 combined training manual.
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Owner will furnish an instructor to describe Owner's operational philosophy.
 - 2. 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 Construction Manager, with at least seven days' advance notice.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written test or demonstration performance-based test, as appropriate to subject.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 017900

SECTION 024116 - STRUCTURE DEMOLITION**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Demolition and removal of buildings.

B. Related Sections:

1. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.

- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

1.3 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.

1.4 SUBMITTALS

- A. Qualification Data: For qualified refrigerant recovery technician.

- B. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain including means of egress from those buildings.

- C. Schedule of Building Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.
2. Temporary interruption of utility services.
3. Shutoff and capping of utility services.

- D. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit before the Work begins.

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

1.5 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.
- D. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be demolished.
 - 2. Review structural load limitations of existing structures.
 - 3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review and finalize protection requirements.
 - 5. Review procedures for noise control and dust control.
 - 6. Review procedures for protection of adjacent buildings.
 - 7. Review with Owner items that will be salvaged by the Owner.

1.6 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Conduct building demolition so operations of adjacent occupied buildings will not be disrupted.
 - 1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
 - 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for buildings and structures to be demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: Present in buildings and structures to be 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.
- E. On-site storage or sale of removed items or materials is not permitted.

1.7 COORDINATION

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied buildings.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. 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 building demolition operations.
 - 1. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.
- D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

3.2 PREPARATION

- A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.
- B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished. Coordinate with Owner.

3.3 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
 - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
 - 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
 - a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.

- C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."
1. Protect adjacent buildings and facilities from damage due to demolition activities.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
 7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 2. Maintain fire watch during and for at least 24 hours after flame cutting operations.
 3. Maintain adequate ventilation when using cutting torches.
 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Engineering Surveys: During demolition, perform surveys to detect hazards that may result from building demolition activities.
- C. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- D. Explosives: Use of explosives is not permitted.

3.5 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- C. Salvage: Salvage items listed on demolition plan prior to the start of demolition.
- D. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
 - 1. Remove below-grade construction, including basements, foundation walls, and footings, completely.
- E. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.
 - 1. Piping: Disconnect piping at unions, flanges, valves, or fittings.
 - 2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

3.6 SITE RESTORATION

- A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."
- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project.
 - 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.
- B. Do not burn demolished materials.

3.9 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
 - 1. Clean roadways of debris caused by debris transport.

END OF SECTION 024116

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

- 1. Section 031000 "Concrete Forming and Accessories" for form-facing materials and waterstops.
- 2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
- 3. Section 033300 "Architectural Concrete" for general building applications of specially finished formed concrete.
- 4. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.
- 5. Section 321313 "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference:

- 1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
- 2. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction joints, control joints, isolation joints, and joint-filler strips.
 - c. Semirigid joint fillers.
 - d. Vapor-retarder installation.
 - e. Anchor rod and anchorage device installation tolerances.
 - f. Cold and hot weather concreting procedures.
 - g. Concrete finishes and finishing.
 - h. Curing procedures.
 - i. Forms and form-removal limitations.

- j. Shoring and reshoring procedures.
- k. Methods for achieving specified floor and slab flatness and levelness.
- l. Floor and slab flatness and levelness measurements.
- m. Concrete repair procedures.
- n. Concrete protection.
- o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
- p. Protection of field cured field test cylinders.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following.

- 1. Portland cement.
- 2. Fly ash.
- 3. Slag cement.
- 4. Blended hydraulic cement.
- 5. Silica fume.
- 6. Performance-based hydraulic cement
- 7. Aggregates.
- 8. Admixtures:
 - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
- 9. Vapor retarders.
- 10. Floor and slab treatments.
- 11. Liquid floor treatments.
- 12. Curing materials.
 - a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.
- 13. Joint fillers.
- 14. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

- 1. Mixture identification.
- 2. Minimum 28-day compressive strength.
- 3. Durability exposure class.
- 4. Maximum w/cm.
- 5. Calculated equilibrium unit weight, for lightweight concrete.
- 6. Slump limit.
- 7. Air content.
- 8. Nominal maximum aggregate size.
- 9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.

C. Shop Drawings:

- 1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.

- D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:
1. Concrete Class designation.
 2. Location within Project.
 3. Exposure Class designation.
 4. Formed Surface Finish designation and final finish.
 5. Final finish for floors.
 6. Curing process.
 7. Floor treatment if any.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

- B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Floor and slab treatments.
5. Bonding agents.
6. Adhesives.
7. Vapor retarders.
8. Semirigid joint filler.
9. Joint-filler strips.
10. Repair materials.

- C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement.
7. Aggregates.
8. Admixtures:

- a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

- D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

- E. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.

- F. Preconstruction Test Reports: For each mix design.

- G. Field quality-control reports.

H. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

1. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Field Quality Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, and qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests shall be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report: Slump.
2. Air content.
3. Water-Cement ratio.
4. Seven-day compressive strength.
5. 28-day compressive strength.
6. Standard deviation.
7. ACI required compressive strength
8. Unit weight.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.10 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

1. Warranty Period: 1 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II
2. Fly Ash: ASTM C618, Class F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, portland blast-furnace slag cement.
5. Silica Fume: ASTM C1240 amorphous silica.

C. Normal-Weight Aggregates: ASTM C33/C33M, class 3M coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C260/C260M.

- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete
1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 2. Retarding Admixture: ASTM C494/C494M, Type B.
 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
 7. Set-Accelerating 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 and complying with ASTM C494/C494M, Type C.
 8. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
 9. Permeability-Reducing Admixture: ASTM C494/C494M, Type S, hydrophilic, permeability-reducing crystalline admixture, capable of reducing water absorption of concrete exposed to hydrostatic pressure (PRAH).
 - a. Permeability: No leakage when tested in accordance with U.S. Army Corps of Engineers CRC C48 at a hydraulic pressure of 200 psi for 14 days.

- F. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, ; not less than 15 mils thick with a maximum perm rating of .01. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.4 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. when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
1. Color:
 - a. Ambient Temperature Below 50 deg F: Black.
 - b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
 - c. Ambient Temperature Above 85 deg F: White.
- D. Curing Paper: Eight-foot-wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
- E. Water: Potable or complying with ASTM C1602/C1602M.
- F. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.
- G. Clear, Waterborne, Membrane-Forming, Nondissipating Curing Compound: ASTM C309, Type 1, Class B, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- H. Clear, Waterborne, Membrane-Forming, Curing Compound: ASTM C309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

- I. Clear, Solvent-Borne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.
- J. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber
- B. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

2.6 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 C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 - 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 in accordance with ASTM C109/C109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 - 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 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.7 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
 - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash or Other Pozzolans: 25 percent by mass.
 - 2. Slag Cement: 50 percent by mass.
 - 3. Silica Fume: 10 percent by mass.
 - 4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
 - 5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
 - 1. Use high-range water-reducing admixture 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.
 - 3. Use water-reducing admixture in pumped concrete and concrete with a w/cm below 0.50.
 - 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
 - 5. Use permeability-reducing admixture in concrete mixtures where indicated.

2.8 CONCRETE MIXTURES

- A. Class A : Normal-weight concrete used for footings.
 - 1. Minimum Compressive Strength: As indicated at 28 days.
 - 2. Slump Limit: 4 inches, plus or minus 1 inch or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture.
- B. Class B: Normal-weight concrete used for interior slabs-on-ground.
 - 1. Minimum Compressive Strength: As indicated at 28 days.
 - 2. Maximum w/cm: 0.50.
 - 3. Slump Limit: 4 inches, plus or minus 1 inch or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture.
 - 4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
- C. Class C: Normal-weight concrete used for filling steel piles.
 - 1. Minimum Compressive Strength: 3,000 psi at 28 days.
 - 2. Maximum w/cm: 0.45 (non air-entrained).
 - 3. Slump Limit: 5-7 inches (dry, non-vibrated); 7-9 inches (wet, non-vibrated)
 - 4. Cement Content: 640-800 lb/cy (non-vibrated)

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M], and furnish batch ticket information.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.

2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
 1. Daily access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
 4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF 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.
 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
 3. Install reglets to receive 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.

3.4 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
 1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 2. Face laps away from exposed direction of concrete pour.
 3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
 4. Lap joints 6 inches and seal with manufacturer's recommended tape.
 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

3.5 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 2. Place joints perpendicular to main reinforcement.

- a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: 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 on Drawings.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints:
1. Install dowel bars and support assemblies at joints where indicated on Drawings.
 2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
1. If a section cannot be placed continuously, provide construction joints as indicated.
 2. Deposit concrete to avoid segregation.
 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- F. 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. Do not place concrete floors and slabs in a checkerboard sequence.
 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 3. Maintain reinforcement in position on chairs during concrete placement.
 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 5. Level concrete, cut high areas, and fill low areas.
 6. Slope surfaces uniformly to drains where required.
 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING FLOORS AND SLABS

- A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish:
1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
 2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
 3. Apply float finish to surfaces to receive trowel finish.
- C. Trowel Finish:
1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.

2. Continue troweling passes and restraigten until surface is free of trowel marks and uniform in texture and appearance.
 3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 4. Do not add water to concrete surface.
 5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
 6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
 - a. Slabs on Ground:
 - 1) Specified overall values of flatness, F_F 35; and of levelness, F_L 25; with minimum local values of flatness, F_F 24; and of levelness, F_L 17.
 - b. Suspended Slabs:
 - 1) Specified overall values of flatness, F_F 35; and of levelness, F_L 20; with minimum local values of flatness, F_F 24; and of levelness, F_L 15.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.
1. Coordinate required final finish with Architect before application.
 2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
 2. Coordinate required final finish with Architect before application.
- 3.8 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS
- A. Filling In:
1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
 2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
 3. Provide other miscellaneous concrete filling indicated or required to complete the 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. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
1. Cast-in inserts and accessories, as shown on Drawings.
 2. Screed, tamp, and trowel finish concrete surfaces.

3.9 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.
- B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 3. If forms remain during curing period, moist cure after loosening forms.
 4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.
- C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
1. Begin curing immediately after finishing concrete.
 2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12-inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 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.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.

- 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 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.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- c. Floors to Receive Polished Finish: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- d. Floors to Receive Chemical Stain:
 - 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.

- 2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
- 3) Butt sides of curing paper tight; do not overlap sides of curing paper.
- 4) Leave curing paper in place for duration of curing period, but not less than 28 days.

e. Floors to Receive Urethane Flooring:

- 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
- 2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches and sealed in place.
- 3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
- 4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.

f. Floors to Receive Curing Compound:

- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Maintain continuity of coating, and repair damage during curing period.
- 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

g. Floors to Receive Curing and Sealing Compound:

- 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Repeat process 24 hours later and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.10 TOLERANCES

- A. Conform to ACI 117.

3.11 SPECIAL INSPECTIONS

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports. Special Inspections shall be in accordance with Section 1705.3 of the Building Code, refer to Schedule of Special Inspections for detailed requirements.
- B. Field Quality Control: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Special Inspector shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Special Inspector shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Special Inspector shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

- a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
- 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.
 - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
1. Headed bolts and studs.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
 6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 3. Slump Flow: ASTM C1611/C1611M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.

4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and laboratory cure six 4-inch by 8-inch standard cylinder specimens for each composite sample.
 - b. Cast, initial cure, and field cure two sets of three 4-inch by 8-inch standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of two laboratory-cured specimens at seven days and one set of three specimens at 28 days. Maintain one specimen in reserve for later testing if required.
 - b. Test one set of three field-cured specimens at seven days and one set of three specimens at 28 days.
 - c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture 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 if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
11. 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.
12. Additional Tests:
 - a. 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.
 - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.

13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.12 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 033000

SECTION 034500 - PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Precast concrete monumental signage.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include dimensions and finishes.
- B. Shop Drawings: Show fabrication and installation details for pre-cast concrete units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.
- C. Samples:
 - 1. For each color and texture of precast concrete required.
 - 2. For colored mortar.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Material Test Reports: For each mix required to produce pre-cast concrete, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

1.4 QUALITY ASSURANCE

- A. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
- B. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Architectural Precast Association or the Precast/Prestressed Concrete Institute for Group A, Category AT.

PART 2 - PRODUCTS

2.1 PRE-CAST CONCRETE UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Gate Precast.
 - 2. Lucas Concrete Products
 - 3. Metromont Corporation.
 - 4. Shockey Precast Group.
 - 5. Tindall Corporation.
- B. Provide pre-cast concrete units complying with ASTM C 1364 using either the vibrant dry tamp or wet-cast method.

1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
2. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
3. Provide drips on projecting elements unless otherwise indicated.

C. Cure units as follows:

1. Cure units in enclosed moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.

D. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

E. Colors and Textures: As selected by Architect from manufacturers full range.

2.2 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123/A 123M.
- B. Dowels: 1/2-inch- diameter, round bars, fabricated from steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123/A 123M.
- C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner complying with requirements in Section 042000 "Unit Masonry," and expressly approved for intended use by pre-cast concrete manufacturer and cleaner manufacturer.

2.3 MORTAR

- A. Comply with requirements in Section 042000 "Unit Masonry" for mortar materials and mixes.
 1. For setting mortar, use Type N.

2.4 SOURCE QUALITY CONTROL

- A. Engage a qualified independent testing agency to sample and test precast units according to ASTM C 1364.
 1. Include one test for resistance to freezing and thawing.

PART 3 - EXECUTION

3.1 SETTING PRE-CAST CONCRETE IN MORTAR

- A. Install pre-cast concrete units to comply with requirements in Section 042000 "Unit Masonry."
- B. Set units in full bed of mortar with full head joints unless otherwise indicated.
 1. Fill dowel holes and anchor slots with mortar.
 2. Fill collar joints solid as units are set.
 3. Build concealed flashing into mortar joints as units are set.
 4. Keep head joints in coping and other units with exposed horizontal surfaces open to receive sealant.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

- D. Provide sealant joints at copings and other horizontal surfaces, and at locations indicated.
 - 1. Keep joints free of mortar and other rigid materials.
 - 2. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.2 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Pre-cast concrete units may be repaired if methods and results are approved by Architect.
- B. Replace pre-cast concrete units in a manner that results in units matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean pre-cast concrete units as work progresses.
 - 1. Remove mortar fins and smears before tooling joints.
 - 2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed pre-cast concrete units to comply with requirements in Section 042000 "Unit Masonry."

END OF SECTION 034500

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SECTION 035216 - LIGHTWEIGHT INSULATING CONCRETE

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place cellular foam lightweight insulating concrete.

1.3 PRE-INSTALLATION MEETINGS

- A. Pre-Installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include mixing and application instructions for each type of lightweight insulating concrete.
- B. Shop Drawings: Include plans, sections, and details showing roof slopes, lightweight insulating concrete thicknesses, embedded insulation board, roof penetrations, roof perimeter terminations and curbs, control and expansion joints, and roof drains.
- C. Design Mixtures: For each lightweight insulating concrete mix.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and testing agency.
 - 1. Submit a letter from the proposed lightweight insulating concrete system supplier confirming that the Contractor is approved to install the proposed lightweight insulating concrete system.
- B. Product Certificates: For the following, from manufacturer:
 - 1. Cementitious materials.
 - 2. Foaming agents.
 - 3. Admixtures.
 - 4. Molded-polystyrene insulation board.
 - a. Submit a letter from the supplier of the proposed lightweight insulating concrete system confirming that the expanded polystyrene used as a component in the lightweight insulating concrete system is to be furnished by the supplier of the proposed lightweight insulating concrete system.
- C. Installation Instructions: Submit manufacturer's instructions for proper placement of the proposed lightweight insulating concrete roof insulation system.
- D. Sample Warranty: Submit a sample copy of the warranty covering the proposed lightweight insulating concrete system.

- E. Material Test Reports: For lightweight aggregates, from a qualified testing agency, indicating compliance with requirements.
- F. Field quality-control test reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An Installer who employs and retains, throughout the project, supervisors who are trained and approved by manufacturer.
 - 1. A firm that has been evaluated by UL and found to comply with requirements of the National Roof Deck Contractors Association Lightweight Insulating Concrete Roof Deck Contractors (LWIC) Accreditation Program.
- B. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original undamaged packages or acceptable bulk containers.
- B. Store packaged materials to protect them from elements or physical damage.
- C. Do not use cement that shows indications of moisture damage, caking, or other deterioration.

1.8 PROJECT CONDITIONS

- A. Do not place lightweight insulating concrete unless ambient temperature is at least 40 degrees F and rising.
 - 1. When air temperature has fallen or is expected to fall below 32-degrees F, heat water to a maximum 120-degrees F before mixing so lightweight insulating concrete, at point of placement, reaches a temperature of 50-degrees F minimum and 80-degrees F maximum.
- B. Do not place lightweight insulating concrete during rain or snow or on surfaces covered with standing water, snow, or ice.
- C. Do not install more lightweight insulating concrete than can be roofed in fourteen (14) days.

1.9 WARRANTY

- A. Insulation System Warranty: Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the insulation system manufacturer's 20-year labor and materials warranty. The warranty shall include the specified new lightweight insulating concrete system consisting of aggregate fill and polystyrene panels. All repair or replacement costs covered under the guarantee shall be borne by the insulation system manufacturer. The warranty shall be for a 10-year term, without deductibles or limitations on coverage amount, and be issued at no additional cost to the Owner. Specific items covered during the term of the warranty include:
 - 1. The actual resistance to heat flow through the roof insulation will be at least 80% of the design thermal resistance, provided that the roofing membrane is free of leaks.

2. The warranty will not limit, by geographic location, the Owner's rights for claims, actions, and/or proceedings.
3. The roof insulation material will not cause structural damage to the building as a result of expansion from thermal or chemical action.

NOTE: THE INSULATION SYSTEM MANUFACTURER SHALL BE ACCEPTABLE TO THE MEMBRANE ROOFING MANUFACTURER.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Where indicated, provide lightweight insulating concrete identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency.
 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 CELLULAR LIGHTWEIGHT INSULATING CONCRETE

- A. Produce cellular lightweight insulating concrete with the following minimum physical properties using cementitious materials, air-producing liquid-foaming agents, complying with ASTM C 869/C 869M, and the minimum amount of water necessary to produce a workable mix.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Celcore Incorporated.
 - b. Cellular Concrete LLC, Mearlcrete Division.
 - c. Elastizell Corporation of America.
 - d. Lite-Crete Inc.
 - e. Siplast.
 2. As-Cast Unit Weight: 34 to 48 lb/cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
 3. Oven-Dry Unit Weight: 28 to 36 lb/cu. ft., when tested according to ASTM C 495.
 4. Compressive Strength: Minimum 200 psi, when tested according to ASTM C 495.

2.3 MATERIALS

- A. Cementitious Material: Portland cement, ASTM C 150, Type I or Type II.
- B. Foaming Agent: ASTM C 869.
- C. Water: Clean, potable.
- D. Molded-Polystyrene Insulation Board: ASTM C 578, Type I, 1.00-lb/cu. ft. minimum density.
 1. Provide units with manufacturer's standard keying slots of approximately 3 percent of board's gross surface area.
- E. One-way Moisture Relief Vents: McKinley Roof Vents, Lexsuco Spun Aluminum or approved by the roofing system manufacturer.

2.4 DESIGN MIXTURES

- A. Prepare design mixtures for each type and strength of lightweight insulating concrete by laboratory trial batch method or by field-test data method. For trial batch method, use a qualified independent testing agency for preparing and reporting proposed mixture designs.
- B. Limit water-soluble chloride ions to the maximum percentage by weight of cement or cementitious material permitted by ACI 301.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Ensure that all surfaces to receive lightweight insulating concrete are free of oil, grease, paints/primers, loose mill scale, dirt, or other foreign substances. Where necessary, cleaning or other corrections of surfaces to receive lightweight insulating concrete is the responsibility of the party causing the unacceptable condition of the substrate.
- B. Do not begin placement of the lightweight insulating concrete system until the general contractor and insulation system applicator have examined surfaces to receive the roof insulation system and determined that the surfaces are acceptable.

3.2 PREPARATION

- A. Remove water or any other substance that would interfere with bonding of the lightweight concrete system.

3.3 MIXING AND PLACING

- A. Mix and place lightweight insulating concrete according to manufacturer's written instructions, using equipment and procedures to avoid segregation of mixture and loss of air content.
- B. Install insulation board according to lightweight insulating concrete manufacturer's written instructions. Place insulation board in wet, lightweight insulating concrete slurry poured a minimum of 1/8 inch over the structural substrate. Ensure full contact of insulation board with slurry. Stagger joints and tightly butt insulation boards.
 - 1. Install insulation board in a stair-step configuration with a maximum step-down of 1 inch.
- C. Install the lightweight concrete system to provide for a minimum thermal value of R-30.
- D. Provide a minimum of 2-inches of topping over the insulation boards.
- E. Deposit and screed lightweight insulating concrete in a continuous operation until an entire panel or section of roof area is completed. Do not vibrate or work mix except for screeding or floating. Place to depths and slopes indicated.
- F. Finish top surface smooth, free of ridges and depressions, and maintain surface in condition to receive subsequent roofing system.

- G. Begin curing operations immediately after placement and air cure for not less than three days, according to manufacturer's written instructions.
- H. If ambient temperature falls below 32 degrees F, protect lightweight insulating concrete from freezing and maintain temperature recommended by manufacturer for 72 hours after placement.
- I. See the structural drawings for roof slope that is provided by the roof framing system.
- J. Install additional lightweight concrete at roof eaves to provide a consistent edge metal elevation.
- K. Provide sumps at primary roof drains as shown on drawings. Minimum system thickness at drains shall be R-30.
 - 1. Box out roof sumps and place separately from main field installation.
- L. Avoid roof-top traffic over the roof insulation system until one can walk over the surface without creating surface damage.
- M. Provide protection over the lightweight insulating concrete after curing to prevent the accumulation of excess moisture in the roof insulation system.
- N. Install one-way moisture relief vents at a rate of 900 square feet of roof area.
 - 1. Core down to temporary roof.
 - 2. Fill opening with pea gravel.
 - 3. Locate vents symmetrically by chalk line. Layout to be accepted by Engineer before installation.
 - 4. Plastic vents are not acceptable.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform field tests and inspections, and prepare test reports.
- B. Testing of samples of lightweight insulating concrete obtained according to ASTM C 172, except as modified by ASTM C 495, shall be performed according to the following requirements:
 - 1. Determine as-cast unit weight during each hour of placement, according to ASTM C 138/C 138M.
 - 2. Determine oven-dry unit weight and compressive strength according to ASTM C 495. Make a set of at least six molds for each day's placement, but not less than one set of molds for each 5000 sq. ft. of roof area.
 - 3. Perform additional tests when test results indicate that as-cast unit weight, oven-dry unit weight, compressive strength, or other requirements have not been met.
 - a. Retest cast-in-place lightweight insulating concrete for oven-dry unit weight and compressive strength.

3.5 DEFECTIVE WORK

- A. Refinish, or remove and replace, lightweight insulating concrete if surfaces are excessively scaled or too rough to receive roofing according to roofing membrane manufacturer's written instructions.
- B. Remove and replace lightweight insulating concrete that fails to comply with requirements.

END OF SECTION 035216

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Concrete building brick.
3. Clay face brick.
4. Mortar and grout.
5. Steel reinforcing bars.
6. Masonry-joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under This Section:

1. Steel lintels in unit masonry.
2. Steel shelf angles for supporting unit masonry.
3. Cavity wall insulation.

C. Related Requirements:

1. Section 055000 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
2. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

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. Shop Drawings: For the following:
 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Verification: For each type and color of the following:
 1. Face brick, in the form of straps of five or more bricks.

2. Special brick shapes.
3. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
4. Weep holes.
5. Accessories embedded in masonry.

1.5 INFORMATIONAL SUBMITTALS

- A. 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. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For Installer and testing agency. Material Certificates: For each type and size of the following:
1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C67.
 - d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 2. Integral water repellent used in CMUs.
 3. Cementitious materials. Include name of manufacturer, brand name, and type.
 4. Mortar admixtures.
 5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 6. Grout mixes. Include description of type and proportions of ingredients.
 7. Reinforcing bars.
 8. Joint reinforcement.
 9. Anchors, ties, and metal accessories.
- C. 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 according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

- A. Masonry Installer: A single, experienced firm specializing in masonry construction with a minimum five year record of successful completion of projects of similar scope, capable of providing labor and material and performance bonds for its portion of the Work that are acceptable to the Owner. Installer shall furnish all required materials and equipment and perform the work of this Section with its own regular employees.
1. The masonry supervisor/foreman shall have had at least 5 years of experience with at least 5 projects of similar size and nature; he shall not act as or become a production worker.
 2. The lead/crew chief masons shall have had at least 3 years of experience with at least 5 projects of similar size and nature;
 3. Installer shall have experienced superintendent and crew chiefs on site supervising the work whenever work is in progress.
 4. Contractor's Own Forces: Contractor may utilize own forces for work of this Section when Contractor and Contractor's superintendent and crew chiefs meet the above qualifications.
 5. Approved Joint Venture: Installer may consist of a joint venture between two or more experienced firms, each meeting the qualifications indicated above.
- B. Limitations on Aggregates: For concrete masonry units containing recycled materials or post-industrial waste, provide units free of impurities that will cause rusting, staining, or popouts and with a record of successful in-service performance in conditions similar to those expected at Project site.
1. Ferrous material shall be removed by magnetic separation.
 2. Aggregates shall contain no combustible materials or coal cinders.
 3. Aggregates shall be graded and supplied in consistent gradations from batch to batch.
 4. Materials shall be tested according to the following:
 - a. ASTM C40: Organic Impurities in Fine Aggregates for Concrete.
 - b. ASTM C136: Sieve Analysis of Fine and Course Aggregate.
 - c. ASTM C641: Iron Staining Materials in Lightweight Concrete Aggregates.
 - d. ASTM C151: Autoclave Expansion of Hydraulic Cement (for popouts).
 - e. ASTM C331: Lightweight Aggregates for Concrete Masonry Units.
- C. 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. Clay Masonry Unit Test: For each type of unit required, per ASTM C 67.
 2. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.
 3. Grout Test (Compressive Strength): For each mix required, per ASTM C 1019.
 4. Mortar Test: For mortar properties per ASTM C 270.
- D. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
1. Build sample panels for typical exterior wall in sizes approximately 48 inches long by 48 inches high by full thickness.
 2. Clean one-half of exposed faces of panels with masonry cleaner indicated.
 3. Protect approved sample panels from the elements with weather-resistant membrane.
 4. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.

- E. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
1. Build mockups for each type of exposed unit masonry construction in sizes approximately 48 inches long by 72 inches high by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.
 - b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
 - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
 - d. Include metal studs, sheathing, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
 - e. Include clay face brick on one face of interior unit masonry wall mockup.
 2. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
 3. Protect accepted mockups from the elements with weather-resistant membrane.
 4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Daily Log: Maintain a daily log of masonry work in progress for inspection by Owner, Architect, Special Inspector, or Authority Having Jurisdiction.
1. Indicate on small scale plans where masonry was erected.
 2. Identify crew and assigned work area.
 3. Certify that the following tasks have been performed.
 - a. Inspection of reinforcing and thru-wall flashings.
 - b. Inspection of construction and verification of compliance with requirements.
 - c. Testing of cavity drainage.
 - d. Daily cleaning.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
- F. Cleaning Masonry Surfaces: Comply with manufacturer's requirements and environmental conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
 - a. For Concrete Masonry Units: $f'_m = 2000$ psi.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C1314.

2.3 UNIT MASONRY, GENERAL

- A. 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.
- B. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

- 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.
 2. Provide bullnose units for outside corners of interior CMU wall construction at all locations, including window openings and pilasters, unless otherwise indicated.
- B. CMUs: ASTM C90.
 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
 2. Density Classification: Lightweight.
 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
 4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.5 CONCRETE AND MASONRY LINTELS

- A. 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.

2.6 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.

3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Clay Face Brick: Facing brick complying with ASTM C216.

1. Manufacturers: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - a. Acme Brick (Basis-of-Design).
 - 1) BR1: Slate Gray.
 - 2) BR2: Steele Gray.
 - b. General Shale Brick, Inc.
 - c. Red River Brick.
 - d. Palmetto Brick Company.
 - e. Pine Hall Brick
 - f. Taylor Clay Products, Inc.
 - g. Triangle Brick Company.
2. Grade: SW.
3. Type: FBS.
4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
5. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C67.
6. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
7. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
8. Application: Use where brick is exposed unless otherwise indicated.

2.7 MORTAR AND GROUT MATERIALS

- 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 shall not be more than 0.1 percent when tested according to 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.
 1. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Argos USA; Eaglebond Portland Cement Lime.
 - b. Holcim U.S.; Cement-Lime.
 - c. SPEC MIX, Inc.; Portland Lime & Sand Masonry Mortar.
- D. Masonry Cement: Not permitted.
- E. Mortar Cement: ASTM C1329/C1329M.
 1. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Argos USA; Superbond Mortar Cement.
 - b. Holcim U.S.; Mortar Cement.
 - c. SPEC MIX, Inc.; Mortar Cement and Sand Mortar.

- F. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
1. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Argos USA; Eaglebond Mortar Cement.
 - b. Holcim U.S.; Holcim Mortamix Custom Color Mortar Cement.
 - c. SPEC MIX, Inc.; Colored Mortar.
 2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 3. Pigments shall not exceed 10 percent of portland cement by weight.
 4. Pigments shall not exceed 5 percent of mortar cement by weight.
- G. Aggregate for Mortar: ASTM C144.
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.
- H. Aggregate for Grout: ASTM C404.
- I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Euclid Chemical Company (The); Accelguard 80.
 - b. GCP Applied Technologies; Morset.
 - c. Master Builders Solutions; a Sika company; MasterSet AC 534.
- J. Water: Potable.

2.8 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. 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: 0.187-inch diameter.
 4. Wire Size for Cross Rods: 0.187-inch diameter.
 5. Wire Size for Veneer Ties: 0.187-inch diameter.
 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.
- E. Masonry-Joint Reinforcement for Multiwythe Masonry:

1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches wide, plus one side rod at each wythe of masonry 4 inches wide or less.
2. Tab type, either ladder or truss design, with one side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe, but with at least 5/8-inch cover on outside face.
3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

- F. Masonry-Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187-inch- diameter, hot-dip galvanized carbon steel continuous wire.

2.9 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
 2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
- C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
 2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- diameter, hot-dip galvanized steel wire.
- D. Partition Top Anchors: 0.105-inch- thick metal plate with a 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- E. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
 2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch- thick steel sheet, galvanized after fabrication.
 3. Fabricate wire ties from 0.187-inch- diameter, hot-dip galvanized-steel wire unless otherwise indicated.
 4. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section. Provide gasketed anchor or separate self-adhering tape to seal penetrations in air barrier. Confirm tape is compatible with fluid-applied air barrier.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Hohmann & Barnard, Inc.; X-Seal Veneer Anchor with x-seal tape.
 - 2) Heckman Building Products; #315D anchor plate with #316 triangular ties and
 - 3) Wire Mold; Type III Screw-on Veneer Anchor with Anchorseal tape.

2.10 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: As specified in Section 076200 "Sheet Metal Flashing and Trim."
- B. Flexible Flashing: Use one of the following unless otherwise indicated:
1. Copper-Laminated Flashing: 5-oz./sq. ft. copper core with polymer fabric laminated to copper face on both sides with non-asphaltic adhesive. Use only where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Hohmann & Barnard, Inc.; Copper-Fabric SA Flashing.
 - 2) Wire-Bond; Copper Seal.
 - 3) York Manufacturing, Inc.; Multi-Flash 500.
 2. Laminated Stainless Steel Fabric Flashing, Non-Asphaltic: Stainless steel core with polymer fabric laminated to one stainless steel face with non-asphalt adhesive. Provide with manufacturer recommended accessory items for a complete compatible system.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Hohman and Barnard, Inc.; Mighty-Flash Stainless Steel Fabric Flashing.
 - 2) Illinois Products, Inc.; IPCO Stainless Steel Fabric Flashing.
 - 3) STS Coatings, Inc.; Gorilla Flash Stainless Fabric.
 - 4) TK Products, Inc.; TK TWF.
 - 5) York Manufacturing, Inc.; Multi-Flash SS.
 3. Self-Adhering Stainless Steel Flashing: 2-mil, Type 304 stainless steel core with one uncoated stainless steel face with butyl block copolymer adhesive. Use where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Hohman and Bernard, Inc.; Mighty-Flash SA.
 - 2) Illinois Products, Inc.; IPCO Self-Adhesive Stainless Steel.
 - 3) TK Products, Inc.; TK Self-Adhering Stainless Steel TWF.
 - 4) Vapro Shield, Inc.; Vapro Thru-Wall Flashing SA.
 - 5) Wire-Bond; Bond'n Flash.
 - 6) York Manufacturing, Inc.; York 304 SS.
- C. Application: Unless otherwise indicated, use the following:
1. Where flashing is indicated to receive counterflashing, use metal flashing.
 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge or flexible flashing with a metal drip edge.
 4. Where flashing is fully concealed, use metal flashing or flexible flashing.
- D. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
- E. Accessories: Provide preformed inside and outside corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- F. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- G. Drip Edges: Stainless-steel, 0.016-inch thick.

- H. Termination Bars for Flexible Flashing: Stainless steel sheet 0.019 inch by 1-1/2 inches with a 3/8 inch sealant flange at top.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).
- D. Weep/Cavity Vent Products: Use the following unless otherwise indicated:
1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Advanced Building Products, Inc.
 - 2) Hohmann & Barnard, Inc.
 - 3) WIRE-BOND.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Advanced Building Products, Inc.
 - b. CavClear; Archovations Inc.
 - c. Hohmann & Barnard, Inc.
 - d. Mortar Net Solutions.
 2. Configuration: Provide the following:
 - a. Strips, full depth of cavity and 12 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.

2.12 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: Subject to compliance with requirements, provide products by one of the following:
 - a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
 - b. EaCo Chem, Inc.
 - c. PROSOCO, Inc.

2.13 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. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
 3. For exterior masonry, use portland cement-lime or mortar cement mortar.
 4. For reinforced masonry, use portland cement-lime or mortar cement mortar.
 5. 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 C270, Proportion 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 reinforced masonry, use Type S.
 3. For mortar parge coats, use Type S.
 4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
 5. For interior nonload-bearing partitions, Type O may be used instead of Type N.
- D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
1. Mix to match Architect's sample.
 2. Application: Use colored-aggregate mortar for exposed mortar joints with the following units:
 - a. Clay face brick.
- E. Grout for Unit Masonry: Comply with ASTM C476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

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 the Work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Verify that substrates are free of substances that impair mortar bond.

- 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 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. Mix units from several pallets or cubes as they are placed.
- F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
 - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.
 - 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 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 bond pattern indicated on Drawings; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 1. Install compressible filler in joint between top of partition and underside of structure above.
 2. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. General: Prepare mortar in accordance with current Portland Cement Association publications.

- B. Prepare fresh mortar at the rate it will be used, in order to maintain consistent color and workability. Do not use mortar that has stiffened because of hydration. Discard when not used within the time recommended by mortar manufacturer or PCA publications, whichever is shorter. Retemper mortar carefully to avoid color changes, no more than twice per batch.
- C. Measure mortar materials using cubic foot measuring box or other approved container of known volume, of size appropriate for operation. Use a consistent ratio of water to mortar materials, within the range recommended by the mortar manufacturer's written instructions.
1. Measurement of sand by shovel shall not be permitted.
- D. Lay hollow brick and 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.
- E. Lay solid masonry units and hollow brick 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.
- F. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.

3.6 COMPOSITE MASONRY

- A. Bond wythes of composite masonry together using one of the following methods:
1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
 - a. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) ties.
 2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
- B. Bond wythes of composite masonry together using bonding system indicated on Drawings.
- C. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.
- D. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.

1. Provide continuity with masonry-joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.
- E. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
1. Provide individual metal ties not more than 16 inches o.c.
 2. Provide continuity with masonry-joint reinforcement by using prefabricated T-shaped units.
 3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

3.7 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
 2. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Bond wythes of cavity walls together using bonding system indicated on Drawings.
- C. 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 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 2. Embed connector sections and continuous wire in masonry joints.
 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 4. Space anchors as indicated, but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally, with not less than one anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.
 5. Space anchors as indicated, but not more than 16 inches o.c. vertically and 25 inches o.c. horizontally, with not less than one anchor for each 3.5 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.
 6. Space anchors as indicated, but not more than 18 inches o.c. vertically and horizontally. Install additional anchors within 12 inches of openings and at intervals, not exceeding 24 inches, around perimeter.
- B. Provide not less than 2 inches of airspace between back of masonry veneer and face of sheathing.
1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.9 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.10 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.11 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.
- C. Form expansion joints in brick as follows:
 - 1. Build in compressible joint fillers where indicated.
 - 2. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."
- D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.12 LINTELS

- A. Install steel lintels where indicated.
- B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.13 FLASHING, WEEP HOLES, AND CAVITY VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
 3. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under air barrier, lapping at least 4 inches. Fasten upper edge of flexible flashing to sheathing through termination bar.
 4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
 6. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
- 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 exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
 1. Use specified weep/cavity vent products to form weep holes.
 2. Space weep holes 24 inches o.c. unless otherwise indicated.
- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

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/ACI 530.1/ASCE 6.
- 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/ACI 530.1/ASCE 6 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 KEY LOCK BOX INSTALLATION
- A. Coordinate location with local fire department.
 - B. Install in accordance with manufacturer's written installation instructions.
- 3.16 FIELD QUALITY CONTROL
- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
 - B. Water Testing: Upon request of the Architect, and as often as deemed appropriate by the Contractor, the cavity drainage system shall be tested by pouring a 5-gallon bucket of water into the masonry cavity, or use a hose bib, to verify system performance.
 - C. Flashing Inspections: Prior to concealment by closure of wall, coordinate and schedule inspection of through-wall flashings with Architect.
 - D. Inspections: Special inspections according to Level 1 special inspections according to Section 1704.5 of the North Carolina Building Code, current edition.
 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified proportions of site-prepared grout.
 - E. Testing Prior to Construction: One set of tests.
 - F. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
 - G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
 - H. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.
 - I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

3.17 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and 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 or pressurized water cleaning methods described in BIA Technical Notes 20.
 - 6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
 - 7. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.18 MASONRY WASTE DISPOSAL

- A. Excess Masonry Waste: Remove excess clean masonry waste and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 051200 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Structural steel.
2. Shrinkage-resistant grout.
3. Shear stud connectors.

- B. Related Sections:

1. Division 1 Section "Special Inspection Services" for administrative and procedural requirements for special inspection services.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear, braced frame, moment frame and lintel and girt connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering design by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360.
2. Use LRFD; data are given at factored-load level.

- B. Construction: Combined system of braced frame and shear walls.

1.5 SUBMITTALS

- A. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Provide setting drawings, templates, and directions for installation of anchor rods and other anchorages to be installed as work of other sections
3. Include embedment drawings.

4. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
5. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
6. For structural-steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Qualification Data: For qualified fabricator.

C. Welding certificates. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated with Building QMS certification.

1. Fabricator shall be registered with and approved by authorities having jurisdiction.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 360.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992.
- B. Channels, Angles, M, S-Shapes: ASTM A 36.
- C. Plate and Bar: ASTM A 36.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C, structural tubing.
- E. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
- B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Plain.
- C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- D. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - 1. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 3. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 4. Finish: Plain.

2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanizing Repair Paint: ASTM A 780.

2.4 BLACK ASPHALTUM PAINT

- A. Ultra high bond, single-component coal tar mastic for protecting steel below grade.

2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

- C. Bolt Holes: Cut, drill or punch standard bolt holes perpendicular to metal surfaces.

- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

- 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/D1.1M and manufacturer's written instructions.

- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened, unless otherwise indicated.

- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.8 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. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
1. SSPC-SP 2, "Hand Tool Cleaning."
 2. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
 2. Galvanize lintel assemblies and loose masonry shelf angles.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after 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.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of baseplate.
 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Apply two heavy coats of black asphaltum paint to all steel below grade.
- D. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- E. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- F. Splice members only where indicated.
- G. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- I. 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/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened, unless otherwise indicated.

- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 SPECIAL INSPECTIONS

- A. Special Inspections and tests shall be performed by the Special Inspector or Special Inspection Agency.
- B. Where fabrication of structural load-bearing members and assemblies is being performed on the premises of the fabricators shop, special inspection of the fabricated item shall be performed.
 - 1. Verify that the fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and that those procedures are being implemented. This inspection will provide a basis for determination of the fabricator's ability to conform to approved drawings, project specifications, and referenced standards.
 - 2. Exception: Special Inspections will not be required where the work is done on the premises of a fabricator registered and approved to perform such work without special inspection. Approval shall be based upon review of the fabricator's written procedural and quality control manuals and periodic auditing of fabrication practices. At completion of fabrication, the fabricator shall submit a certificate of compliance stating that the work was performed in accordance with the approved construction documents.
- C. Verification and inspection of steel construction shall be in accordance with Table 1704.3 of 2018 North Carolina Building Code, and as follows:
 - 1. Welding: Welding inspection shall be in compliance with AWS D1.1. In addition to visual inspection, welds may be tested and inspected according to AWS D1.1 and the following inspection procedures, at Special Inspector's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
 - 2. Details: Perform periodic inspections of the erected structural steel framing to verify compliance with the details shown on the construction documents and approved shop drawings such as member locations, size and spacing, connection details, bracing and bolted and welded connections.
 - 3. High Strength Bolts: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 - a. General: While work is in progress, determine that the requirements for installation of bolts, nuts, washers and bolted parts are met. For bolts requiring pretensioning, observe the preinstallation testing and calibration procedures when such procedures are required by the installation method or by project plans or specifications; determine that all plies of connected materials have been drawn together and properly snugged and monitor the installation of bolts to verify that the selected procedure for installation is properly used to

- tighten bolts. For joints required to be tightened only to snug-tight condition, verify that the connected materials have been drawn together and properly snugged.
- b. Periodic monitoring: Monitoring of bolt installation for pretensioning is permitted to be performed on a periodic basis when using the turn-of-nut method with matchmarking techniques, the direct tension indicator method or the alternate design fastener (twist-off bolt) method. Joints designated as snug tight shall be inspected on a periodic basis.
 - c. Continuous monitoring: Monitoring of bolt installation for pretensioning using the calibrated wrench method or the turn-of-nut method without matchmarking shall be performed on a continuous basis.
4. Shear Studs: Test and inspect welded shear connectors according to requirements in AWS D1.1 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 on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- E. Additional testing performed to determine compliance of corrected work with specified requirements shall be at Contractor's expense.
- 3.6 REPAIRS AND PROTECTION
- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
 - B. Touchup Painting: Cleaning and touchup painting are specified in Division 09 Painting Sections.

END OF SECTION 051200

SECTION 052100 - STEEL JOIST 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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. K-series steel joists.
 - 2. Long-span steel joists.
 - 3. Joist accessories.
- B. Related Sections include the following:
 - 1. Division 1 Section "Special Inspection Services" for administrative and procedural requirements for special inspection services.

1.3 DEFINITIONS

- A. SJI "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
- B. Design special joists to withstand design loads with live load deflections no greater than the following:
 - 1. Roof Joists: Vertical deflection of 1/360 of the span.

1.5 SUBMITTALS

- A. Shop Drawings: Show layout, designation, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, joist accessories; splice and connection locations and details; and attachments to other construction.
 - 1. Indicate locations and details of bearing plates to be embedded in other construction.
 - 2. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

- B. Welding certificates.
- C. Qualification Data: For manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables of SJI "Specifications."
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. SJI Specifications: Comply with standard specifications in SJI's "Specifications" that are applicable to types of joists indicated.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction to ensure continuity of construction.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel: Comply with SJI's "Specifications" for web and steel-angle chord members.
- B. Steel Bearing Plates: ASTM A 36.
- C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Plain, uncoated.
- D. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain.
- E. Welding Electrodes: Comply with AWS standards.

2.2 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.3 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
 - 1. Joist Type: K-series steel joists.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- D. Camber joists according to SJI's "Specifications."
- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 LONG-SPAN STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as follows:
 - 1. Joist Type: DLH-series steel joists.
 - 2. End Arrangement: Underslung.
 - 3. Top-Chord Arrangement: As indicated.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Camber long-span steel joists according to SJI's "Specifications."
- D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.5 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Steel bearing plates with integral anchorages are specified in Division 05 Section "Metal Fabrications."

- C. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.
- D. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.6 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Apply 1 coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 - 4. Do not rigidly connect bottom-chord extensions to columns or supports.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 SPECIAL INSPECTIONS

- A. Special Inspections and tests shall be performed by the Special Inspector or Special Inspection Agency.

- B. Where fabrication of structural load-bearing members and assemblies is being performed on the premises of the fabricators shop, special inspection of the fabricated item shall be performed.
1. Verify that the fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and that those procedures are being implemented. This inspection will provide a basis for determination of the fabricator's ability to conform to approved drawings, project specifications, and referenced standards.
 2. Exception: Special Inspections will not be required where the work is done on the premises of a fabricator registered and approved to perform such work without special inspection. Approval shall be based upon review of the fabricator's written procedural and quality control manuals and periodic auditing of fabrication practices. At completion of fabrication, the fabricator shall submit a certificate of compliance stating that the work was performed in accordance with the approved construction documents.
- C. Verification and inspection of steel construction shall be in accordance with Table 1704.3 of 2018 North Carolina Building Code, and as follows:
1. Welding: Welding inspection shall be in compliance with AWS D1.1. In addition to visual inspection, welds may be tested and inspected according to AWS D1.1 and the following inspection procedures, at Special Inspector's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
 2. Details: Perform periodic inspections of the erected steel joist framing to verify compliance with the details shown on the construction documents and approved shop drawings such as member locations, size and spacing, bearing, welds at seats and installation of bridging.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- E. Additional testing performed to determine compliance of corrected work with specified requirements shall be at Contractor's expense.

3.4 REPAIRS AND PROTECTION

- A. Touchup Painting: Cleaning and touchup painting are specified in Division 09 Painting Sections.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100

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SECTION 053100 - STEEL DECKING

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. Type BSV slot vented roof deck.
 - 2. Type BPA cellular acoustical roof deck.
 - 3. Type VLI composite floor deck.
- B. Related Sections include the following:
 - 1. Division 1 Section "Special Inspection Services" for administrative and procedural requirements for special inspection services.

1.3 SUBMITTALS

- A. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- B. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- B. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. 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 TYPE BSV ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 2. Deck Profile: As indicated.
 3. Profile Depth: 1-1/2 inches.
 4. Design Uncoated-Steel Thickness: As indicated.
 5. Span Condition: Triple span or more.
 6. Side Laps: Overlapped.
 7. Vent Slot Area: Manufacturer's standard vent slots providing 1-1/2 percent open area.

2.2 TYPE BPA CELLULAR ACOUSTICAL ROOF DECK

- A. Acoustical Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 2. Cellular Deck Profile: As indicated, with bottom plate.
 3. Profile Depth: 1-1/2 inches.
 4. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
 5. Span Condition: Triple span or more.
 6. Side Laps: Overlapped.
 7. Acoustical Perforations: Cellular deck units with manufacturer's standard perforated flat-bottom plate welded to ribbed deck.
 8. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber.
 - a. Factory install sound-absorbing insulation into cells of cellular deck.
 9. Acoustical Performance: NRC 0.80, tested according to ASTM C 423.

2.3 TYPE VLI COMPOSITE FLOOR DECK

- A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 2. Profile Depth: 2 inches.
 3. Design Uncoated-Steel Thickness: As indicated.
 4. Span Condition: Triple span or more.

2.4 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- C. 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.
- D. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated.
- E. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- F. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- G. Galvanizing Repair Paint: ASTM A 780.

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.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, 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.

3.3 ROOF-DECK INSTALLATION

- 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: As indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals indicated, and as follows:
 - 1. Mechanically fasten side laps with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. Weld perimeter edges.
- 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.
 - 1. Install reinforcing channels or zees in ribs to span between supports and weld.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

3.4 FLOOR-DECK INSTALLATION

- 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: As indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches, and as follows:
 - 1. Mechanically fasten side laps with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. Weld perimeter edges.
- 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: Butted.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 SPECIAL INSPECTIONS

- A. Special Inspections and tests shall be performed by the Special Inspector or Special Inspection Agency.
- B. Verification and inspection of metal deck construction shall be in accordance with Table 1704.3 of 2018 North Carolina Building Code, and as follows:
 1. Welding: Welding inspection shall be in compliance with AWS D1.3.
 2. Details: Perform periodic inspections of the installed steel decking to verify compliance with the details shown on the construction documents and approved shop drawings such as deck layout, gage, bearing, side laps, end laps and quantity and spacing of welds and screws.
 3. Shear Studs: Test and inspect welded shear connectors according to requirements in AWS D1.1 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 on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
- C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- D. Additional testing performed to determine compliance of corrected work with specified requirements shall be at Contractor's expense.

3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

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SECTION 054000 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior non-load-bearing wall framing.
 - 2. Exterior ceiling joist, soffit and fascia framing.
 - 3. Interior suspended overhead framing including ceilings, ceiling clouds, bulkheads and soffits.
 - 4. All framing designated as "CFMF-S" on drawings.
- B. Related Sections include the following:
 - 1. Division 1 Section "Special Inspection Services" for administrative and procedural requirements for special inspection services.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads:
 - a. Dead Loads: Weights of materials and construction.
 - b. Wind Loads: As indicated.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
 - 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 1 inch.
- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
 - 2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 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 signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- 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 installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- C. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

1.6 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 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G60.
- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: 50, Class 1 or 2.
 - 2. Coating: G90.

2.2 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch.
 - 2. Flange Width: 1-5/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch.
 - 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

2.3 EXTERIOR CEILING JOIST, SOFFIT AND FASCIA FRAMING

- A. Members: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329 inch.
 - 2. Flange Width: 1-5/8 inches, minimum.

2.4 INTERIOR SUSPENDED OVERHEAD FRAMING

- A. Members: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329 inch.
 - 2. Flange Width: 1-5/8 inches, minimum.

2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Stud kickers, knee braces, and girts.
 - 8. Hole reinforcing plates.
 - 9. 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/A 123M.
- B. 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.
- C. 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.
- D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.

2.8 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed metal framing members by screw fastening. Wire tying of framing members is not permitted.
 - a. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
 - 4. Fasten other materials to cold-formed metal framing by 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.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw 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.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by screw fastening. Wire tying of framing members is not permitted.
 - a. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's 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.

3.3 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to bottom track, unless otherwise indicated. Space studs as follows:
 1. Stud Spacing: 16 inches, maximum.
- 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. Connect vertical deflection clips to bypassing studs and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 2. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.4 EXTERIOR CEILING JOIST, SOFFIT AND FASCIA INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
 1. Joist Spacing: 24 inches, maximum.
- D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.

- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
 - 1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
- G. Secure joists to load-bearing walls or supporting framing to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.5 INTERIOR SUSPENDED OVERHEAD FRAMING INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
 - 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
 - 1. Joist Spacing: 24 inches, maximum.
- D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
 - 1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
- G. Secure joists to load-bearing walls or supporting framing to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 SPECIAL INSPECTIONS

- A. Special Inspections and tests shall be performed by the Special Inspector or Special Inspection Agency.
- B. Verification and inspection of steel construction shall be in accordance with Table 1704.3 of 2018 North Carolina Building Code, and as follows:

1. Details: Perform periodic inspections of the installed cold-formed metal framing to verify compliance with the details shown on the construction documents and approved shop drawings such as member size, gage, location and spacing, connection details and miscellaneous framing.
- C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- D. Additional testing performed to determine compliance of corrected work with specified requirements shall be at Contractor's expense.

3.7 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. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 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. Elevator machine beams, hoist beams.
5. Steel shapes for supporting elevator door sills.
6. Shelf angles.
7. Metal ladders.
8. Parapet crossover ladder.
9. Metal bollards.
10. Metal ships ladders
11. Metal downspout boots.
12. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section:

1. Loose steel lintels.
2. Shelf angles anchored to masonry walls.
3. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

B. Delegated Design:

1. Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
2. Design concealed lintels, including comprehensive engineering analysis signed and sealed by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

D. 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.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.

2. Paint products.
3. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

C. Samples for Verification: For each type and finish of extruded nosing; and each type and finish of special shapes.

D. 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 responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

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. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. 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.

PART 2 - PRODUCTS

2.1 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 A 36/A 36M.
- C. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.
- E. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- F. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- G. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.2 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.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. 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.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- E. 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.
- F. 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.
- G. 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.

2.3 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 Section 091113 "Exterior Painting" and Section 09123 "Interior Painting."
- 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: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.4 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.

2.5 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. Galvanize miscellaneous framing and supports on exterior and where indicated.

D. Prime miscellaneous framing and supports with primer specified in Section 099600 "High-Performance Coatings" where indicated.

2.6 SHELF ANGLES

A. Fabricate shelf angles from steel angles or bent plates of sizes indicated and for attachment to steel, masonry or concrete framing.

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. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

2.7 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- square 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. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
8. Galvanize exterior ladders, including brackets.
9. Prime exterior ladders, including brackets and fasteners, with zinc-rich primer.
10. Provide minimum 72-inch- high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.

2.8 PARAPET CROSSOVER LADDER

A. Provide metal parapet crossovers where indicated. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.

1. Fabricate parapet crossovers, including railings from aluminum.
2. Fabricate treads and platforms from extruded-aluminum plank grating. Limit openings in gratings to no more than 1/2 inch in least dimension. Provide non-skid surface.

2.9 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 80 steel pipe.
- B. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch- thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.
- C. Precast Bollard Domes: Provide 5000 psi, fiber-reinforced precast concrete pipe bollard caps with Class A formed finish and symmetrically domed profile.
- D. Galvanize exterior bollards.
- E. Prime bollards with zinc-rich primer. Field finish in accordance with Section 099113 "Exterior Painting."

2.10 METAL SHIPS' LADDERS

- A. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.
 - 1. Treads shall be not less than 5 inches exclusive of nosing or less than 8-1/2 inches including the nosing, and riser height shall be not more than 9-1/2 inches.
 - 2. Fabricate ships' ladders, including railings from steel.
 - 3. Fabricate treads from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 3/4 inch in least dimension.
 - 4. Comply with applicable railing requirements in Section 055213 "Pipe and Tube Railings."

2.11 ELEVATOR PIT SUMP COVERS

- A. Fabricate from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 3/4 inch in least dimension.
- B. Provide steel angle supports as indicated.

2.12 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.

2.13 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.

2.14 METAL DOWNSPOUT BOOTS

- A. Provide downspout boots made from aluminum in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.
1. Basis of Design: "Model SV – Pipe Downspout" by Piedmont Pipe or equal.
 2. Boot height: 12-inches.
 3. Provide manufacturer's standard cleanout integral with downspout boot.

2.15 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.

2.16 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.

2.17 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 or masonry, or unless otherwise indicated.
1. Shop prime with primers specified in Division 09 painting Sections.
- C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
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.

2.18 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.

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.

3.3 INSTALLING METAL BOLLARDS

- A. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.
- B. Fill bollards solidly with concrete, mounding top surface to shed water.
 - 1. Do not fill removable bollards with concrete.

3.4 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.

3.5 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. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

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SECTION 055113 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preassembled steel stairs with concrete-filled treads.

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.
 - 1. 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.
 - 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.

1.3 ACTION SUBMITTALS

- A. Product Data: For metal pan stairs and the following:
 - 1. Abrasive nosings.
 - 2. Shop primer products.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Verification: For each type and finish of nosing.
- D. Delegated Design Submittal: For stairs,, 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 State 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 the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs,, 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 or 1/4 inch, whichever is less.
- C. Seismic Performance of Stairs: Metal stairs withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Component Importance Factor: 1.5.

2.2 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. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.
- D. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011/A1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.

2.3 ABRASIVE NOSINGS (MSN-1)

- A. Extruded Units: Aluminum units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:

- a. Wooster Products, Inc. (Basis-of-Design).
 - 1) Product: Supergrit Safety Treads Type 231BF.
 - b. American Safety Tread.
 - c. Amstep Products.
 - d. Babcock-Davis.
 - e. Nystrom Building Products.
2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.
 3. Nosings, Square-Back Units: 3 inches wide, without lip.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- C. 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 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. 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 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. 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.
- B. Prefilled Concrete Treads:
1. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with minimum 28-day compressive strength of 3000 psi and maximum aggregate size of 1/2 inch unless otherwise indicated.

2.6 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, 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 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 #2 - Completely sanded joint with some undercutting and pinholes okay.
- 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.

2.7 FABRICATION OF STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Commercial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
1. Stringers: Fabricate of steel plates steel channels or steel rectangular tubes.
 - a. Stringer Size: As indicated on Drawings.
 - b. Provide closures for exposed ends of channel and rectangular tube stringers.
 - c. Finish: Shop primed.
 2. Platforms: Construct of steel plate or steel channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.
 - a. Provide closures for exposed ends of channel and rectangular tube framing.
 - b. Finish: Shop primed.
 3. Weld stringers to headers; weld framing members to stringers and headers.
- C. 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. 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.
 2. 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.
 3. Shape metal pans to include nosing integral with riser.

4. Attach abrasive nosings to risers.
5. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.8 FINISHES

- A. Finish metal stairs after assembly.
- B. Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- C. 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.

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 PAN 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. 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.
 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.

- F. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."
1. Install abrasive nosings with anchors fully embedded in concrete.
 2. Center nosings on tread width.

3.3 REPAIR

- A. Touchup Painting:
1. 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.
 - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF SECTION 055113

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior and exterior steel pipe and tube railings.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Railing brackets.
 - 2. Grout, anchoring cement, and paint products.
- 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 responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- D. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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 AND SCHEDULING

- 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 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.
- C. 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 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: 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.
- C. 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.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

2.2 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.

1. 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.

2.3 STEEL AND IRON

- A. Tubing: ASTM A 500 (cold formed).
- 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.

2.4 FASTENERS

- A. General: Provide the following:
 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
 2. Hot-Dip Galvanized Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.
 3. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- 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. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.
 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. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

- A. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Shop Primers: Provide primers that comply with Division 09 painting Sections.
- D. Intermediate Coats and Topcoats: Provide products that comply with Division 09 painting Sections.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

- 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.
- G. 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 and where indicated 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.

2.6 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 welded 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.
 - 2. By bending or by inserting prefabricated elbow fittings.
- K. Bend members in jigs to produce uniform curvature for each 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 plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer 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 stainless-steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal 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.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.8 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
 - 4. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 - 5. 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.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner and as follows.

1. Comply with SSPC-SP 16.
- 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: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below:
 1. Exterior Railings: SSPC-SP 6/NACE No. 3.
 2. Railings Indicated to Receive Primers: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 3. Other Railings: SSPC-SP 3, "Power Tool Cleaning."
- F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 1. Shop prime uncoated railings with primers specified in Division 09 painting Sections.
 2. Do not apply primer to galvanized surfaces.

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. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with wood or dissimilar metals.
- 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. 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 "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 one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

- A. 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 or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.
- C. 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.
 - 2. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.

3.5 ATTACHING RAILINGS

- A. Attach railings to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
 - 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- B. Secure wall brackets and railing end flanges 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. Steel-Framed Partitions: At steel framed partitions, use one of the following methods:
 - a. Set hanger or lag bolts into wood backing between studs. Coordinate with stud installation to locate backing members.
 - b. Self-tapping screws fastened to steel framing or to concealed steel reinforcements.
 - c. Toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 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 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.

3.7 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.

END OF SECTION 055213

SECTION 055813 - METAL COLUMN WRAPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes metal column wraps.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product, including finishing materials.
- B. Shop Drawings: Show fabrication and installation details for column covers.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design.
- D. Samples for Verification: For each type of exposed finish required, prepared on 6-inch- square Samples of metal of same thickness and material indicated for the Work.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing column covers similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Organic-Coating Applicator Qualifications: A firm experienced in successfully applying organic coatings of type indicated to metals of types indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockups of typical column covers.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver column covers wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

PART 2 - PRODUCTS**2.1 SNAP-TOGETHER COLUMN WRAPS**

- A. Form column covers to shapes shown on Drawings from metal of type and minimum thickness indicated below. Return vertical edges and bend to form hook that engages continuous mounting clips.
1. Aluminum Composite Material: Provide factory-formed and -assembled, aluminum-faced composite panels fabricated from two 0.020-inch thick, coil-coated aluminum sheet facings bonded, using no glues or adhesives, to solid, extruded thermoplastic core; formed into profile indicated.
 2. Aluminum Sheet: ASTM B 209, with not less than strength and durability properties of Alloy 5005-H32, 0.063 inch thick.
 - a. Finish: High-performance organic coating.
 3. Column covers may be fabricated from prefinished metal sheet in lieu of finishing after fabrication provided unfinished edges are concealed from view.
 4. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide flat surfaces where indicated.
 5. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
 6. Form returns at vertical joints to provide 1/2-inch- wide reveal at joints. Provide snap-in metal filler strips at reveals that leave reveals flush.
 7. Fabricate column covers without horizontal joints.
 8. Fabricate base and ceilings ring to match column covers.
 9. Fabricate with calk stop/stiffener ring.
 10. Apply manufacturer's recommended sound-deadening insulation or mastic to backs of column covers.

2.2 MISCELLANEOUS MATERIALS

- A. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.
1. Provide concealed fasteners for interconnecting column covers and for attaching them to other work unless otherwise indicated.
 2. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- B. Sound-Deadening Materials:
1. Insulation: Unfaced, mineral-fiber blanket insulation complying with ASTM C 665, Type I, and passing ASTM E 136 test.
 2. Mastic: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- C. Backing Materials: Provided or recommended by column cover manufacturer.

2.3 FABRICATION, GENERAL

- A. Coordinate dimensions and attachment methods of column covers with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.
- B. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends.

2.4 GENERAL FINISH REQUIREMENTS

- A. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Apply organic finishes to formed metal after fabrication unless otherwise indicated.
- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

- A. Metallic Fluoropolymer: AAMA 2605. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: Custom to match Section 074243 "Metal Composite Wall Panel."

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 column covers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate and place column covers plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install column covers.
 - 1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- B. Use concealed anchorages where possible.
- C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.
- D. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.

3.3 ADJUSTING AND CLEANING

- A. Clean copper alloys according to metal finisher's written instructions in a manner that leaves an undamaged and uniform finish matching approved Sample.
- B. Touchup Painting: Immediately after erection, clean abraded areas of shop paint and paint exposed 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.
- C. 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.

3.4 PROTECTION

- A. Protect finishes from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION 055813

SECTION 0610 00 - ROUGH CARPENTRY FOR ROOFS

PART 1 GENERAL

1.1 SUMMARY

- A. This section covers all roofing system wood blocking, curbs, nailers, misc. blocking and edges as may be required for roofing work to comply with the drawings and industry standards.
- B. Section Includes:
 - 1. Addition of new nailers, blocking or equipment curbs to raise flashing heights to industry standards and/or to meet Factory Mutual requirements for compliance with FM Bulletin 1-49. Where project is in a high wind area as defined by Factory Mutual, fastening requirements shall comply with the most stringent standard applicable to the geographical area.
 - 2. All lumber and/or plywood (exterior glue), so designated on the plans and/or in the Specifications, shall be fire- rated, #2 grade min. southern yellow pine by a pressure process or other means during manufacture. The wood shall have, when tested in accordance with ASTM E-84 or UL 723, a listed flame spread index of 25 or less and show no evidence of significant progressive combustion when the test is continued for an additional 20-minute period.
- C. Related Sections:
 - 1. Section 03 52 16 – Lightweight Insulating Concrete
 - 2. Section 07 52 00 – Modified Bituminous Membrane Roofing
 - 3. Section 07 62 00 – Sheet Metal Flashing and Trim
 - 4. Section 07 72 00 – Roof Accessories

1.2 QUALITY ASSURANCE

- A. For each use, comply with the American Soft Wood and Lumber Standard PS 20 by the United States Department of Commerce. Nominal sizes are shown or specified; provide actual sizes complying with the minimum size requirements of PS 20 for the moisture content specified for each use.
- B. Grading rules and trademarks:
 - 1. Southern Pine Inspection Bureau – SPIB
 - 2. American Plywood Association – APA
 - 3. American Lumber Standards Committee
 - 4. United States Products Standards (PS 1)
 - 5. National Forest Products Association – National Design Specification for Wood Construction
- C. Local Building Codes - All applicable provisions. Whenever a particular attachment methodology is to be employed for fastening wood blocking or nailers to structural elements of the building, the standards, methodology, thickness, and frequency of attachment shall be as specified in Factory Mutual Bulletin 1-49, or its successor document and ANSI/SPIRI ES-1 minimum requirements.

PART 2 PRODUCTS

2.1 MARKINGS AND LABELS

- A. All wood products shall be clean and free of all surface deposits.

- B. Each piece shall be indelibly ink stamped with the Quality Mark of an approved independent third-party inspection agency having a follow up testing and inspection service at the treating plant over the quality of the treated product, and whose service is certified by an approved overview agency such as SPIB (Southern Yellow Pine Inspection Bureau), or TPI (Timber Products Inspection).
- C. Quality Mark Stamp shall include the following in a legible format: logo of the overview agency, logo of the inspection agency, the quality standard to which treated, the retention of the fire retardant, the purpose for which the product has been treated, the word KDAT (Kiln Dried After Treatment).
- D. All treated lumber products specified for structural uses shall bear an indelible ink stamp, signifying that the lumber has been marked by, or under the supervision of, an inspection agency certified by the ALSC and conforms to the requirements of the applicable grading rules.
- E. All treated plywood products specified shall bear an indelible ink stamp indicating conformance to a plywood grade description contained in the current issue of U.S. Products Standards PS 1-90.

2.2 PRODUCT HANDLING

- A. Treated wood products that are to be painted or required to be kiln dried after treatment shall be stored off the ground and under cover at the job site and protected from the weather until used.

2.3 COORDINATION

- A. All wood products shall be kiln dried after treatment (KDAT) to a maximum moisture content of 19% for lumber and 18% for plywood.
- B. The Project Designer has designated all structural uses for treated wood products based on the applicable species and grade in accordance with the National Design Specification for Wood Construction of National Forest Products Association, and/or the Plywood Design specification of American Plywood Association. Use only the species and grade specified for each use application.

2.4 WOOD RECEIVING PRESSURE TREATMENT

- A. Treat the following lumber and/or plywood items used in this project as follows:
 - 1. Wood blocking for roof edge nailers
 - 2. Parapet wood nailers
 - 3. Roof edge fascias
 - 4. Roof equipment support curbs
 - 5. Expansion joint curbs
 - 6. Plywood as parapet sheathing
 - 7. Any other wood curbing or blocking coming into contact with, moisture, masonry, concrete, or for other incidental uses related to the roofing system.

2.5 PLYWOOD - ALL PLYWOOD SHALL MEET THE FOLLOWING REQUIREMENTS:

- A. Each construction and industrial panel shall be identified with the appropriate trademark of the American Plywood Association and shall meet the requirements of the latest edition of U.S. Product Standard PS 1-90 or APA PRP-108 Performance Standards.
- B. All panels shall be classified as "Exterior" rated.
- C. Panel thickness, grade, and Group Number of Span Rating shall be at least equal to that shown on the drawings. Application shall be in accordance with the recommendations of the American Plywood Association.

- D. Sheathing permanently exposed to weather shall be classed "Exterior" rated. Install with the long dimension or strength axis of the panel across supports, except where noted, and with panel continuous over two or more spans. Suitable edge support shall be provided where indicated in recommendations of the American Plywood Association by use of panel clips, tongue-and-groove edges, or lumber blocking between joists. Panel end joints shall occur over framing. Allow 1/8" spacing at panel ends and edges, unless otherwise recommended by the panel manufacturer. Nail 6" O.C. along supported panel edges top and bottom and 12" o.c. at intermediate supports, except that when supports are spaced 48" o.c. or more, space nails at 6" o.c. at all supports. Provide a minimum of three (3) fasteners at panel edges. Use 6d nails for panels 1/2" and less and 8d nails for a greater thickness, except that when panels are 1-1/8", use 8d ring shank or 10d nails. Fasteners must be hot-dipped zinc-coated galvanized steel, stainless steel, or polymer acrylic coated.

2.5 FASTENERS

- A. For Attachment of Lumber or Plywood to Concrete and Masonry - Use flat head hot-dipped galvanized, stainless steel, or polymer acrylic coated double threaded masonry screws. Holes are to be pre-drilled in masonry to a depth 1/2" deeper than the fastener is to penetrate.
- B. For Attachment of Wood Nailers to Steel Members - Use flat-head or hex-head, polymer acrylic coated or stainless steel, No. 10 sheet metal screw inserted through minimum 5/8" diameter galvanized steel washers.

PART 3 EXECUTION

3.1 FABRICATION AND INSTALLATION

- A. All wood members are to be fastened using screws as specified. Nails be used as noted above and/or as determined by the Roofing Consultant.
- B. Where necessary, pre-drill holes to ensure no splitting of wooden members occurs. The use of self-drilling brass double concentric thread screws is permitted in lieu of pre-drilling.
- C. Screw guns and drills shall be calibrated and adjusted in such a way as to prevent over-drilling or stripping of holes or threads. Insert fasteners flush with surface or slightly recessed not to exceed 1/8". Do not overtighten metal to metal components such that fasteners strip, or on metal to wood such that the visibly metal 'puckers' more than 1/64".
- D. All details and wood nailers are to be installed in accordance with the details shown in the Factory Manual Loss Control Bulletin 1-49 or the National Roofing Contractors Association Roofing and Waterproofing Manual- Latest Edition, whichever is most stringent.
- E. All nailers are to be installed straight and shimmed when necessary to ensure tight fit and finish.
- F. When installing pieces in multiple components, end joints shall be staggered a minimum of 24". All joints are to be staggered in such a way that nowhere does a joint fall over a joint.
- G. All fastener requirements including size, frequency, pattern, and gauge shall meet the federal, state, or local codes or Factory Mutual, whichever is more stringent.

END OF SECTION 061000

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SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood blocking, cants, and nailers.
2. Plywood backing panels.

1.2 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NeLMA: Northeastern Lumber Manufacturers' Association.
 2. NLGA: National Lumber Grades Authority.
 3. SPIB: The Southern Pine Inspection Bureau.
 4. WCLIB: West Coast Lumber Inspection Bureau.
 5. WWPA: Western Wood Products Association.
- C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
1. Preservative-treated wood.

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 materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
- B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS**2.1 WOOD PRODUCTS, GENERAL**

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWP A U1.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants or otherwise adversely affect finishes.
 3. Use Categories:
 - a. AWP A U1-UC2: Interior, potentially damp applications, such as beams, timbers, flooring, framing, millwork, sill plates.
 - b. AWP A U1-UC3B: Exterior, non-coated not in contact with ground, such as decking, sills, walkways, piers, railings/pickets.
 - c. AWP A U1-UC4A: Exterior, in contact with ground normal, such as fence/deck posts.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, blocking, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood blocking, sleepers, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWP A C20 (lumber) and AWP A C27 (plywood).
1. Use treatment that does not promote corrosion of metal fasteners.
 2. Exterior: Use type for exterior locations and where indicated.
 3. Interior: Use Type A, High Temperature (HT) for enclosed roof framing and where indicated.
 4. Interior: Use Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- D. Application: Treat all interior and concealed wood blocking in and attached to rated walls and miscellaneous carpentry, unless otherwise indicated.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 1. Blocking.
 2. Nailers.
 3. Cants.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.
- C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
 1. Spruce-pine-fir (south) or spruce-pine-fir, Construction or 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 2. Eastern softwoods, No. 2 Common grade; NELMA.
- D. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness and fire-retardant treated per AWWA C27.
 1. Provide intumescent paint on all 6 sides.
 2. Use Interior Type A, unless otherwise indicated.
 3. Use treatment that does not promote corrosion of metal fasteners.
 4. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 316 stainless steel.

- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Wood Screws: ASME B18.6.1.
- D. 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.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

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. Do not splice structural members between supports, unless otherwise indicated.
- C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated.
- D. 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.
- E. Comply with AWWA 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.
- F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- G. 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.
 - 1. Do not use wood blocking in fire-resistance-rated assemblies.
- 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 061053

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SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Wall sheathing.

1.2 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.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those 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 design designations from UL's "Fire Resistance Directory."

1.4 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 WALL SHEATHING

- A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
 - 1. Product: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corporation; GlasRoc
 - b. G-P Gypsum Corporation; DensGlass Gold
 - c. National Gypsum; eXP Sheathing
 - d. United States Gypsum; Securock
 - 2. Type and Thickness: Type X, 5/8 inch thick.
 - 3. Size: 48 by 96 inches.

2.2 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. For gypsum wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

- B. 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.

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. Arrange joints so that pieces do not span between fewer than three support members.
- 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 ICC's "International Building Code."
- D. Coordinate wall sheathing installation with flashing and joint-treatment 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.

3.3 SHEATHING JOINT-AND-PENETRATION TREATMENT

- A. Refer to Section 072726 "Fluid-Applied Membrane Air Barriers" for joint and penetration treatment.

3.4 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing in accordance with Section 072726 "Fluid Applied Membrane Air Barriers" and manufacturer's written instructions.

END OF SECTION 061600

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SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes the following:
1. Display case.
 2. Reception desk.
 3. Solid surface window sills.
 4. Shop finishing of interior woodwork.

1.2 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.3 SUBMITTALS

- A. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 2. Show locations and sizes of cutouts and holes for plumbing fixtures and other items installed in architectural woodwork.
- B. Samples for Verification:
1. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
 2. Veneer-faced panel products with or for transparent finish, 12 by 12 inches, for each species and cut. Include at least one face-veneer seam and finish as specified.
 3. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
 4. Thermoset decorative-panels, 8 by 10 inches, for each type, color, pattern, and surface finish, with edge banding on 1 edge.
 5. Quartz solid-surfacing materials, 12 inches square.
 6. Exposed cabinet hardware and accessories, one unit for each type and finish.
- C. Product Certificates: For each type of product, signed by product manufacturer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 087100 "Door Hardware" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD.
 - 3. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.
 - 4. Softwood Plywood: DOC PS 1.
- C. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
- D. High-Pressure Decorative Laminate (PLM-3 TO PLM-9): NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
 - 1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by the Basis-of-Design indicated or a comparable product by one of the following:
 - a. Wilsonart International; Div. of Premark International, Inc. (Basis of Design).

- 1) Products: As indicated on Interior Finishes Legend on Drawings.
 - b. Formica Corporation.
 - c. Lamin-Art, Inc.
 - E. Glazed Sliding Doors: Tempered glass; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.
 1. Thickness: Not less than 1/4 inch thick.
 2. Number of Doors: Two.
 - F. Shelves: 6-mm-thick tempered glass; supported on adjustable shelf standards and supports.
 1. Shelf Width: 14 inches.
 2. Number of Shelves: As indicated on Drawings.
 - G. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081; mounted on sides. Provide standards full height of display case.
 1. Standards and Brackets (unless otherwise noted): "704" standards, "742" shelf brackets by Reeve Store Equipment Company or equals suitable for recessed track.
 - H. Extruded-Aluminum Bars and Shapes: ASTM B 221, Alloy 6063.
 - I. Aluminum Tubing: ASTM B 429, Alloy 6063.
 - J. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering, and 6 mm thick unless otherwise indicated.
 - K. Solid-Surfacing Material (SSM-2): Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
 1. Manufacturers: Subject to compliance with requirements, provide products by the Basis-of-Design indicated or a comparable product by one of the following:
 - a. LX Hausys; HI-MACS (Basis-of-Design).
 - b. Avonite, Inc.
 - c. E. I. du Pont de Nemours and Company.
 - d. Formica Corporation
 - e. Wilsonart
 2. Type: Standard type, unless Special Purpose type is indicated.
 3. Colors and Patterns: As indicated on Interior Finishes Legend on Drawings.
- 2.2 CABINET HARDWARE AND ACCESSORIES
- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Section 087100 "Door Hardware."
 - B. Butt Hinges: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:
 1. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.
 - C. Back-Mounted Pulls: BHMA A156.9, B02011.
 - D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- F. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- G. Drawer Slides: BHMA A156.9, B05091.
1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
 2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
 3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
 4. Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches high and 24 inches wide.
- H. Door Locks: BHMA A156.11, E07121.
- I. Drawer Locks: BHMA A156.11, E07041.
- J. Grommets for Cable Passage through Countertops: Molded-plastic grommets and matching plastic caps with slot for wire passage. Provide Basis-of-Design products indicated or comparable products approved by Architect.
1. Basis of Design: Doug Mockett and Company.
 - a. Provide "TG" (typical).
 - b. Provide "XG" for large plugs (coordinate locations with Owner prior to installation).
 2. Provide at each sit-down station.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish numbers indicated.
1. Provide sample for verification.
 - a. BHMA 652: Satin chromium plated over nickel, base metal: Steel.
 2. Plastic laminate woodwork:
 - a. BHMA 630: Satin finish stainless steel.
- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

2.4 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
- D. 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.
- E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.

2.5 FIELD BUILT DISPLAY CASE

- A. General: Field built display cases at locations indicated includes carpentry, lighting, adjustable glass shelving system, interior case finish materials, and sliding glass door as indicated on Drawings.
- B. Clear Tempered Float Glass for Doors: ASTM C1048, Type I, Quality q3, Class 1; manufactured by horizontal (roller hearth) process; 1/4-inch thick.
- C. Clear Float Glass for Shelves: ASTM C1036, Type I, Quality q3, Class 1; edges polished; 1/2-inch thick.
- D. Vertical Slotted Type Adjustable Shelf Standards and Related Supports: Provide standards and supports which comply with ANSI/BHMA A156.9. Vertical slots spaced 2-inches on center, 7/8-inch wide x 11/16-inch high x length indicated or required, BHMA No. B84102, zinc-plated steel. Provide shelf brackets of size required to support shelving widths indicated, BHMA No. B84112, zinc-plated steel.
- E. Sliding Door Track Assembly: Provide track assembly to comply with BHMA No. B07051 for bypassing doors including satin aluminum double track, shoe for 1/4-inch thick glass doors, and double channel top and end guides. Provide assembly equal to Knape & Vogt P 1092 ANOD.
- F. Sliding Glass Door Lock: Provide cylinder and "U" strap keeper with chrome or nickel finish to comply with BHMA No. E07191, equal to Knape & Vogt 803XNP.
- G. Illumination System: Concealed top-lighting system consisting of LED fixtures. Include lamps and internal wiring with single concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided.
 - 1. Basis of Design: WAC Lighting; Straight Edge Model LS-LED26-C
 - 2. Remote (Hard Wired): EN-24100-277-R
 - 3. Power Supply: EN-24100-277-RB2-T
 - 4. Adjustable Mounting Clip: SL-C3-WT
- H. Interior Case Finishes: Provide fabric wrapped 1/2-inch thickness "Homosote" panels mounted to rear wall. Fabric shall be Momentum Textiles, Pact, Color Lily. Fit panels between vertical shelf standards for neat flush installation. Hardwood veneer-plywood side, top and bottom panels with transparent finish. Hardwood species and cut to be selected from full range.

- I. Exterior Case Base Exposed Edging: Solid hardwood to match veneer plywood species and finish.

2.6 PLASTIC-LAMINATE RECEPTION DESK

- A. Grade: Custom.
- B. AWI Type of Cabinet Construction: Flush overlay.
- C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade VGS.
 - 4. Edges: 3 mm PVC. Color as selected by Architect from manufacturer's full range.
- D. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 - a. Edges of Plastic-Laminate Shelves: 3 mm PVC. Color as selected by Architect from manufacturer's full range.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
 - 2. Drawer Sides and Backs: Thermoset decorative panels.
 - 3. Drawer Bottoms: Thermoset decorative panels.
- E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
- F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces as selected by Architect from manufacturers standard range.

2.7 SOLID-SURFACING-MATERIAL WINDOW SILLS

- A. Grade: Premium.
- B. Solid-Surfacing-Material Thickness: 1/2 inch.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
 - 1. As selected by Architect from manufacturer's full range.
- D. Fabricate sills in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

2.8 SHOP FINISHING

- A. Grade: Provide finishes of same grades as items to be finished.
- B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

- C. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening, unless covered by trim.
1. Install flush paneling with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
- F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- G. Display Case: Construct as indicated. Install shelving standards plumb and evenly spaced with standard length and slots aligned for continuous level bracket support along length of shelving. Provide case counter (bottom), fabric-wrapped wall panels and ceiling grille "lens" as indicated. Coordinate electrical service box locations for lighting, switching and as otherwise indicated.
1. Provide glass shelving indicated, with polished edges and uniform sizes. Provide appropriate standards.
 2. Properly fit and secured tracks, sliding glass panels and locking device specified. Provide perimeter casing and finishing indicated.
- H. Window Sills: Align adjacent solid-surfacing-material window sills sections of multi-piece sills and form seams to comply with manufacturer's written recommendations using adhesive in color to match sills. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
1. Install window sills with no more than 1/8-inch in 96-inch sag, bow, or other variation from a straight line.

2. Caulk space between window sills and both window unit and wall jambs with sealant specified in Section 079200 "Joint Sealants."
- I. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 2. Maintain veneer sequence matching of cabinets with transparent finish.
 - J. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 1. Align adjacent plastic laminate-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 3. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 4. Calk space between backsplash and wall with sealant specified in Section 079200 "Joint Sealants."
 - K. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

SECTION 064219 - PLASTIC-LAMINATE-FACED WOOD PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced wood paneling.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing paneling that is concealed within other construction before paneling installation.

1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Plastic-laminate-faced wood paneling.

B. Product Data Submittals: For each product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

C. Shop Drawings: For plastic-laminate-faced wood paneling.

1. Include plans, elevations, sections, and attachment details.
2. Show details full size.
3. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.

D. Samples for Verification: For each type of exposed laminate, 8 by 10 inches.

1. Provide one Sample applied to core material and with specified edge material applied to one edge.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer fabricator.

B. Product Certificates: For each type of product.

C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- 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 paneling as indicated on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver paneling until painting and similar operations that might damage paneling have been completed in installation areas. Store paneling in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

- A. Environmental Limitations with Humidity Control: Do not deliver or install paneling until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.
- B. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed/concealed by construction and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is 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 PANELING, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-faced wood paneling (decorative laminate surfacing) indicated for construction, finishes, installation, and other requirements.
 - 1. The Contract Documents contain requirements that are more stringent than the referenced woodwork quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

2.2 PLASTIC-LAMINATE-FACED WOOD PANELING

- A. Grade: Custom.
- B. Plastic Laminate (PLM-3 TO PLM-9): High-pressure decorative laminate complying with ISO 4586-3.
 - 1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by the Basis-of-Design indicated or a comparable product by one of the following:
 - a. Wilsonart International; Div. of Premark International, Inc. (Basis of Design).
 - 1) Products: As indicated on Interior Finishes Legend on Drawings.
 - b. Abet Laminati.
 - c. Formica Corporation.
 - d. Nevamar; a Panolam Surface Systems company.
 - e. Pionite; a Panolam Surface Systems company.
 - 2. Faces: Grade HGS.
 - 3. Backs: Balance material with thickness matching exposed surface.
 - 4. Exposed Edges: Same as faces or Grade VGS.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed surfaces complying with the following requirements:
 - 1. As indicated by manufacturer's designations and as indicated on Interior Finishes Legend on Drawings.
- D. Panel Core: Fire-retardant particleboard or fire-retardant MDF.
 - 1. Thickness: As indicated on Drawings.
- E. Adhesives for Bonding Plastic Laminate: As selected by fabricator to comply with requirements.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
- F. Fire-Retardant-Treated Paneling: Panels are to consist of fire-retardant plastic laminate and fire-retardant particleboard or fire-retardant, medium-density fiberboard (MDF). Panels are to have a flame-spread index of 25 or less and a smoke-developed index of 450 or less per ASTM E84, and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
- G. Assemble panels by gluing and concealed fastening.

2.3 MATERIALS

- A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
- B. Wood Moisture Content: 15 percent.
- C. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
 - 1. MDF: ANSI A208.2, Grade 130.
 - 2. Particleboard (Medium Density): ANSI A208.1, Grade M-2-Exterior Glue.

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.
 4. Mill lumber before treatment and implement procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of paneling.
- C. Fire-Retardant Fiberboard: MDF panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E84.

2.5 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood 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.
- C. Installation Adhesive: Product recommended by panel fabricator for each substrate for secure anchorage.

2.6 FABRICATION

- A. Complete fabrication, including assembly, 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 paneling fabrication will be complete.

- B. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition paneling to humidity conditions in installation areas.
- B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install paneling to comply with quality standard grade of paneling to be installed.
- B. Install paneling level, plumb, true in line, and without distortion. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
 - 1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/16 inch.
- C. Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening unless otherwise indicated.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective paneling, where possible, to eliminate defects. Where not possible to repair, replace paneling. Adjust for uniform appearance.
- B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064219

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SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cold-applied, emulsified-asphalt dampproofing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide auxiliary materials recommended in writing by manufacturer of primary materials.
- B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Euclid Chemical Company (The).
 - 2. Henry Company.
 - 3. Karnak Corporation.
 - 4. Meadows, W. R., Inc.
- B. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.

2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

- C. Patching Compound: Asbestos-free fibered mastic of type recommended in writing by dampproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.
 - 1. Test for surface moisture according to ASTM D 4263.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.
- C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
 - 1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
 - 2. Lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Masonry Backup for Brick Veneer Assemblies: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft.

3.5 CLEANING

- A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 071113

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SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Modified bituminous sheet waterproofing.

1.2 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. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
 - 1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.
- C. Samples: For the following products:
 - 1. 12-by-12-inch square of waterproofing and flashing sheet.
- D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- E. Qualification Data: For Installer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for waterproofing.
- G. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer for installation of waterproofing required for this Project.
- B. Source Limitations: Obtain waterproofing materials, protection course, through one source from a single manufacturer.
- C. Mockups: Before beginning installation, install waterproofing to 100 sq. ft. of slab area and to demonstrate surface preparation, crack and joint treatment, corner treatment, and execution quality.
 - 1. If Architect determines mockups do not comply with requirements, reapply waterproofing and reinstall overlying construction until mockups are approved.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.4 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.

1.5 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.

1.6 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 in width.
 2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Installer's Warranty: Specified form, signed by Installer, covering Work of this Section.
 1. Warranty includes removing and reinstalling backfill and protection board.
 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: Not less than 60-mil- thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil- thick, polyethylene film with release liner on adhesive side.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Hydrotech, Inc.; VM 75.

- b. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRI 860/861.
 - c. CETCO Building Materials Group; Envirosheet.
 - d. GCP Applied Technologies; Bituthene 3000.
 - e. Henry Company; Blueskin WP 200.
 - f. Polyglass, Inc.; a Mapei Group company; Mapethene.
 - g. Mar-Flex; ArmorSheet 600/601.
 - h. Soprema; Colphene 3000
 - i. Tamko; TW-60.
 - j. Meadows, W. R., Inc.; SealTight Mel-Rol.
2. Physical Properties:
- a. Tensile Strength: 250 psi minimum; ASTM D 412, Die C, modified.
 - b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
 - c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
 - d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
 - e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
 - f. Hydrostatic-Head Resistance: 150 feet minimum; ASTM D 5385.
 - g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
 - h. Vapor Permeance: 0.05 perms; 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 wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.
 2. Detail Strips: 62.5-mil- thick, felt-reinforced self-adhesive strip, 9 inches wide, with release film on adhesive side.
- H. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.
- I. Protection Course: Unfaced, fan-folded, extruded-polystyrene board insulation, nominal thickness 1/4 inch with compressive strength of not less than 8 psi per ASTM D 1621.

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. 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.
- F. Bridge and cover isolation joints, expansion joints, and 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 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.
- 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. Begin waterproofing in presence of manufacturer's technical representative.

- 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- minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.
 - 1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.
- D. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.
- E. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic.
- F. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.
- G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.
- H. Immediately install protection course with butted joints over waterproofing membrane. Cut and fit to within 3/4 inch of projections and penetrations.
- I. 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; and to furnish reports to Architect.

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.

END OF SECTION 071326

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SECTION 071800 - TRAFFIC COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes traffic coatings for the following applications:

1. Elevated mechanical room floors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product, including installation instructions.

- B. Shop Drawings: For traffic coatings.

1. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.

- C. Samples for Initial Selection: For each type of exposed finish.

- D. Samples for Verification: For each type of exposed finish, prepared on rigid backing.

1. Provide stepped Samples on backing to illustrate buildup of traffic coatings.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Product Certificates: For each type of traffic coating.

- C. Field quality-control reports.

- D. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For traffic coatings to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

- B. Source Limitations:

1. Obtain traffic coatings from a single manufacturer.
2. Obtain primary traffic coating materials, including primers, from traffic coating manufacturer. Obtain secondary materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of type and from source recommended in writing by primary material manufacturer.

- C. Mockups: Build mockups to set quality standards for materials and execution.

1. Build mockup for each traffic coating and substrate to receive traffic coatings.

2. Size: 100 sq. ft. of each substrate to demonstrate surface preparation, joint and crack treatment, thickness, texture, color, and standard of workmanship.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site.

1. Before installing traffic coatings, meet with manufacturer's technical representative, Architect, Owner, independent testing agency, and other concerned entities. Review requirements for traffic coatings. Notify participants at least seven days before conference.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels showing the following information:

1. Manufacturer's brand name.
2. Type of material.
3. Directions for storage.
4. Date of manufacture and shelf life.
5. Lot or batch number.
6. Mixing and application instructions.
7. Color.

B. Store materials in a clean, dry location protected from exposure to direct sunlight. In storage areas, maintain environmental conditions within range recommended in writing by manufacturer.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.

1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.

B. Do not install traffic coating until items that penetrate membrane have been installed.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace traffic coating that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Adhesive or cohesive failures.
 - b. Abrasion or tearing failures.
 - c. Surface crazing or spalling.
 - d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or comparable product by one of the following:
1. Tremco Incorporated (Basis of Design).
 2. Euclid Chemical Company.
 3. Gaco Western LLC.
 4. Neogard Construction Coatings.
 5. Pecora Corporation.

2.2 MATERIALS, GENERAL

- A. Material Compatibility: Provide primers; base-, intermediate-, and topcoat; and accessory materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

2.3 ELEVATED EQUIPMENT/MECHANICAL ROOM TRAFFIC COATING

- A. Traffic Coating: Manufacturer's standard, traffic-bearing, seamless, high-solids-content, cold liquid-applied, elastomeric, waterproofing membrane system with integral wearing surface for equipment-room floor; according to ASTM C 957.
- B. Primer: Liquid primer recommended for substrate and conditions by traffic-coating manufacturer.
- C. Base Coat: Polyurethane.
1. Product: Tremco; Vulkem 360NF.
- D. Intermediate Coat: Polyurethane.
1. Product: Tremco; Vulkem 950NF.
 2. Aggregate Content: As recommended in writing by traffic-coating manufacturer for substrate and service conditions indicated.
- E. Topcoat: Polyurethane.
1. Product: Tremco; Vulkem 951NF.
 2. Aggregate Content: As recommended in writing by traffic-coating manufacturer for substrate and service conditions indicated.
 3. Color: As selected by Architect from manufacturer's full range.
- F. Aggregate: Manufacturer's standard aggregate for use indicated of particle sizes, shape, and minimum hardness recommended in writing by traffic-coating manufacturer.

2.4 ACCESSORY MATERIALS

- A. Joint Sealants: As specified in Section 079200 "Joint Sealants."
- B. Sheet Flashing: Nonstaining sheet material recommended in writing by traffic-coating manufacturer.
1. Thickness: Minimum 60 mils.

- C. Adhesive: Contact adhesive recommended in writing by traffic-coating manufacturer.
- D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic-coating manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of traffic-coating work.
- B. Verify that substrates are visibly dry and free of moisture.
 - 1. Test for moisture content by method recommended in writing by traffic-coating manufacturer.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of traffic-coating work.
- D. Proceed with installation only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
 - 1. Begin coating application only after minimum concrete-curing and -drying period recommended in writing by traffic-coating manufacturer has passed and after substrates are dry.
 - 2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. General: Before applying traffic coatings, clean and prepare substrates according to ASTM C 1127 and manufacturer's written instructions to produce clean, dust-free, dry substrate for traffic-coating application. Remove projections, fill voids, and seal joints if any, as recommended in writing by traffic-coating manufacturer.
- B. Schedule preparation work so dust and other contaminants from process do not fall on wet, newly coated surfaces.
- C. Mask adjoining surfaces not receiving traffic coatings to prevent overspray, spillage, leaking, and migration of coatings. Prevent traffic-coating materials from entering deck substrate penetrations and clogging weep holes and drains.
- D. Concrete Substrates: Mechanically abrade surface to a uniform profile acceptable to manufacturer, according to ASTM D 4259. Do not acid etch.
 - 1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
 - 2. Remove concrete fins, ridges, and other projections.
 - 3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
 - 4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.

3.3 TERMINATIONS AND PENETRATIONS

- A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written instructions.

- B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.
- C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.
- D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

3.4 JOINT AND CRACK TREATMENT

- A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C 1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.
 - 1. Comply with recommendations in ASTM C 1193 for joint-sealant installation.
- B. Apply reinforcing strip in traffic-coating system where recommended in writing by traffic-coating manufacturer.

3.5 TRAFFIC-COATING APPLICATION

- A. Apply traffic coating according to ASTM C 1127 and manufacturer's written instructions.
- B. Apply number of coats of specified compositions for each type of traffic coating at locations as indicated on Drawings.
- C. Start traffic-coating application in presence of manufacturer's technical representative.
- D. Verify that wet film thickness of each coat complies with requirements every 100 sq. ft.
- E. Uniformly broadcast aggregate on coats specified to receive aggregate. Embed aggregate according to manufacturer's written instructions. After coat dries, sweep away excess aggregate.
- F. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated; omit aggregate on vertical surfaces.
- G. Cure traffic coatings. Prevent contamination and damage during application and curing stages.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to perform the following field tests and inspections:
 - 1. Materials Testing:
 - a. Samples of material delivered to Project site shall be taken, identified, sealed, and certified in presence of Owner and Contractor.
 - b. Testing agency shall perform tests for characteristics specified, using applicable referenced testing procedures.
 - c. Testing agency shall verify thickness of coatings during traffic-coating application for each 600 sq. ft. of installed traffic coating or part thereof.
 - 2. If test results show traffic coating does not comply with requirements, remove and replace or repair the membrane as recommended in writing by traffic-coating manufacturer and make further repairs after retesting until traffic-coating installation passes.

- B. Final Traffic-Coating Inspection: Arrange for traffic-coating manufacturer's technical personnel to inspect membrane installation on completion.
 - 1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.7 PROTECTING AND CLEANING

- A. Protect traffic coatings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071800

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Foam-plastic board insulation.
 2. Glass-fiber blanket insulation.
 3. Mineral-wool blanket insulation.
 4. Mineral-wool board insulation.

1.2 DEFINITIONS

- A. R-Value: Long-term thermal resistance: Determined in accordance with CAN/ULC-S770 and ASTM C1289, Annex A1.

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.
- B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

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 PERFORMANCE REQUIREMENTS

- A. Provide insulation, where indicated, in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.
1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm air velocity.
 2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with *Chaetomium globosum* on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.
- B. Fire-Test-Response Characteristics: For exterior walls assemblies, provide components tested as indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall assemblies.
2. If acceptable to authorities having jurisdiction, provide engineering judgment by registered fire protection engineer in lieu of tested mockup.

1.7 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.
- B. Protect foam-plastic board insulation as follows:
 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 2. Type IV, 25 psi, 1.6 lb./cu. ft. minimum density, unless otherwise indicated.
 3. Provide manufacturer's standard shiplap or tongue and groove edges on vertical applications below grade and over exterior sheathing on metal stud cavity wall assembly.
 4. Thickness: As indicated on Drawings or as required to meet R-value indicated on Drawings.
 5. Thermal Resistance, per ASTM C518, at 75 deg. F mean temperature shall be R-5 per inch.

2.2 GLASS-FIBER BLANKET INSULATION

- A. 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.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville.
 - c. Knauf Insulation.
 - d. Owens Corning.
 2. Free of Formaldehyde: Provide fiber-glass blanket insulation manufactured with 100 percent acrylic binders and no formaldehyde.

2.3 MINERAL-WOOL BLANKET INSULATION

- A. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fibrex Insulations Inc.
 - b. Owens Corning.
 - c. Roxul Inc.
 - d. Thermafiber.

2.4 MINERAL-WOOL BOARD INSULATION

- A. Mineral-Wool Board, Types IA and IB, Unfaced: ASTM C 612, Types IA and IB; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. Nominal density of 4.5 lb/cu. ft.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
 - a. Fibrex Insulation Inc.
 - b. Owens Corning.
 - c. Roxul Inc.
 - d. Thermafiber

2.5 INSULATION FASTENERS

- A. Fasteners: Product recommended and approved by insulation manufacturer, with demonstrated capability to secure insulation to substrates indicated without damaging insulation and substrates and complying with other listed performance characteristics.
- B. Mastic Sealer: Type recommended by insulation manufacturer for bonding edge joints between units and filling voids in work.

2.6 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
1. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
- B. Adhesive for Bonding Insulation: Product recommended and approved by manufacturer, with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

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 SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of 36 inches below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

- A. Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
 - 1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

3.5 INSTALLATION OF BLANKET INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch 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, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- C. Head-of-Wall Joints in Non-Rated Walls and Miscellaneous Voids:

1. Install insulation in miscellaneous voids, head-of-wall joints in non-rated walls, and cavity spaces where required to prevent gaps in insulation using the following materials:
 - a. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
2. Refer to Section 078446 "Fire-Resistive Joint System" for head-of-wall sealant in rated walls.

3.6 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

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SECTION 072221 - ROOF INSULATION AND COVER BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A Installation of roof insulation and cover board over underlayment in roof areas with existing concrete structural roof decks.

1.2 RELATED SECTIONS

- A. Related Sections include the following:
 - 1. Division 7 – PVC Membrane Roofing
 - 2. Division 7 – Standing Seam Metal Roof Panels

1.3 REFERENCES

- A Reference standards of the following sources are applicable to products and procedures specified in Part 2 - Products and Part 3 – Execution of this Section:
 - 1. American Society for Testing and Materials (ASTM)
 - a. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
 - b. ASTM C1278 - Standard Specification for Fiber-Reinforced Gypsum Panel

1.4 SUBMITTALS

- A Refer to Submittals Section for procedural requirements related to the submittal process.

1.5 QUALITY ASSURANCE PROCEDURES

- A **Applicator 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 a manufacturer's warranty. Company shall have a minimum of 5 years documented experience certified by roofing system manufacturer.
- B **Single Source Responsibility:** Roofing system materials and components shall be supplied and warranted by roofing system manufacturer for specified roofing system and shall follow specified regulatory requirements.
- C **Examine the technical specifications and drawings.** Verify all dimensions, detail conditions, roof plan notes and existing site conditions that may affect the work. Verification of existing dimensions and site conditions is the responsibility of the Contractor. No additional compensation will be considered for failure to verify existing dimensions, detail conditions, roof plan note callouts, and existing site conditions.
- D **Upon examination, if conflicts between the technical specifications and drawings, and those of federal, state or local regulatory agencies, the product manufacturer, industry roofing standards, or Owner-mandated requirements are discovered, notify the Owner immediately for resolution.**
- E **During work, if conditions are discovered which do not allow for continuation of the work per the technical specifications and drawings, notify the Owner immediately for resolution.**

1.6 DELIVERY, STORAGE AND HANDLING

- A Deliver materials in manufacturer's original containers, dry, undamaged, seals and labels intact.
- B Store materials in weather protected environment, clear of ground and moisture. Cover insulation, roofing materials, and other moisture-sensitive products with a canvas tarp. Protect foam insulation from direct sunlight exposure.
- C Protect adjacent materials and surfaces against damage from roofing work. Do not store materials on previously completed roofing.

1.7 ENVIRONMENTAL REQUIREMENTS

- A Do not perform work during inclement weather. Refer to product manufacturer for outdoor temperature requirements for installation of materials. Do not install materials at times when the outdoor temperature does not fall within the minimum/maximum temperature requirements of the manufacturer.
- B Cold weather precautions:
 - 1. Store products that may be negatively affected by exposure to cold weather, such as primers, adhesives, sealants and cements, in a heated location. Refer to the roofing manufacturer and NRCA requirements and recommendations for additional cold weather application recommendations and restrictions.
- C Safety Data Sheets (SDS) of all specified products shall remain on site for the duration of this project.

PART 2 – PRODUCTS

2.1 ROOF INSULATION

- A Polyisocyanurate roof insulation system; ASTM C1289, Type II, Class 1, Grade 2 (20 psi); HCFC-Free and Zero Ozone Depletion Potential (ODP); product type acceptable to the roofing manufacturer.
 - 1. Roof Areas Refer Project Manual:
 - a. Slope and Thickness: Refer Drawings.
 - b. Long Term Thermal Resistance (LTTR) Value: 5.0 minimum per inch (Per NRCA).
 - c. Board Size:
 - 1) Insulation used as “fill” for the overlying tapered insulation system: 4-feet by 4-feet. Maximum thickness of insulation “fill” shall be 2-inches.
 - 2) Overlying tapered insulation system: 4-feet by 4-feet. Maximum thickness of tapered insulation boards shall be 2-1/2 inches.

2.2 ROOF COVER BOARD

- A Type: Glass-mat or gypsum-fiber cover board with the meeting the following requirements:
 - 1. Approved for roofing applications.
 - 2. Approved by the roofing membrane manufacturer for use within the assembly.
 - 3. Conforming to ASTM C1177 or C1278.
 - 4. Achieving the specified wind uplift requirements within the specified roof assembly.
- B Thickness: 1/2-inch.
- C Board Size: 4-feet by 4-feet.

2.3 TAPERED EDGE STRIPS

- A Tapered Edge Strips: Fiberboard, ASTM C208; zero to 1-1/2-inches thick x 18-inches wide (or as indicated by conditions shown on the project drawings); product type acceptable to the roofing manufacturer.

2.4 ADHESIVE

- A Where specified, for adhering cover board, and bottom, intermediate, and top layer(s) of insulation, tapered insulation systems, and tapered insulation used in saddle and cricket construction where indicated in PART 3 of this Section: Low-rise urethane foam adhesive; product acceptable to the roofing manufacturer and can meet the specified wind uplift requirements.

2.5 FASTENING DEVICES

- A Termination Bar: Extend aluminum bar, 1 inch by 1/8 inch, with pre-punched holes at 8 inches on center.
- B Insulation Fastener and Plates: Plated steel fastener and 3-inch diameter round or 1-inch square steel plate as manufactured by or specifically recommended by the roof system manufacturer. Fasteners and plates must be factory mutual approved for the specified wind uplift pressures with the specified insulation.

PART 3 – EXECUTION

3.1 GENERAL

- A Ensure that the substrate has been prepared as necessary and is ready and acceptable to receive insulation materials.

3.2 INSULATION AND COVER BOARD INSTALLATION

- A Closely butt the insulation boards and roof cover boards.
- B Stagger board joints by the maximum dimensions possible.
- C Neatly cut insulation and roof cover boards to fit around all penetrations through the roof deck. At locations where less than a full-sized sheet of insulation or cover board is required, use the largest size practical to fill in the area. Do not install numerous small sections of cover board or insulation at these locations.
- D Fill gaps between boards, and between boards and walls, curbs, blocking, and equipment with additional insulation material.
- E Protect all insulation and cover board from weather and standing water at all times. Do not install more insulation and cover board than can be completely covered with the roofing membrane on the same day.
- F Install temporary water cut-offs at the edges of insulation at the end of each workday.
- G Prior to installing the insulation, inspect the underside of the roof deck to determine if objects, such as sprinklers, lights, conduits, fans, or gas lines are attached to the deck. Exercise caution to ensure that insulation fasteners do not penetrate these objects.
- H Mechanically fasten and adhere insulation board and adhere cover board:

1. Adhere cover board and underlying top layer of insulation using the specified adhesive. Refer to the roofing manufacturer for application instructions and requirements.
 - a. Adhere cover board and underlying top insulation board with specified low-rise urethane foam at the following rates:
 - 1) Field of roof: spacing and wide bands of adhesive, per FM roof nav
 - 2) At perimeters: spacing and wide bands of adhesive, per FM roof nav
 - 3) At corners: spacing and wide bands of adhesive, per FM roof nav
 - b. Mechanically fasten single layers or lower layers of insulation board with specified fasteners as recommended by the rrof system manufacturer.

END OF SECTION 072221

SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fluid-applied membrane air barrier, vapor permeable.

1.2 DEFINITIONS

- A. ABAA: Air Barrier Association of America.
- B. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- C. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- D. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 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, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air barrier meets ABAA performance for vapor-permeable air barrier assemblies.
- C. Air Barrier Assembly Air Leakage: Not to exceed 0.01 cfm x sq. ft. of surface area at 1.57 lbf/sq. ft.; ASTM E 283.
- D. Water Resistance: Material shall resist 22 inches water for 5 hours before and after aging when tested per AATCC 127.
- E. Nail Seal-Ability: Material shall allow no water found on nail shanks, on underside of sheathing and/or between sheathing and product coating when tested per ASTM D 1970.
- F. Flammability: Material shall allow a flame spread of less than 25 and smoke development of less than 450 when tested per ASTM E 84.
- G. Fire-Test-Response Characteristics: For exterior walls assemblies, provide components tested as indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall assemblies.
 - 2. If acceptable to authorities having jurisdiction, provide engineering judgment by registered fire protection engineer in lieu of tested mockup.
- H. Adhesion: Material shall exhibit a minimum adhesion of 16 psi when tested per ASTM D 4541.

- I. Compatibility: Material shall be compatible with adjacent materials.
- J. UV Stability: Material shall survive a minimum of six months UV exposure during construction.
- K. System Continuity: Material Manufacturer shall provide materials/system for an interface with windows, door and other penetrations that integrate into a compatible and continuous air barrier assembly.

1.4 ACTION SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.
- B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 1. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.
- B. Qualification Data: For Installer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm with three to five years experience in applying air barrier materials similar in material, design, complexity, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Manufacturer's Technical Representative Qualifications: An authorized full-time employee representative of manufacturer experienced in the installation and maintenance of the specified system and qualified to determine Installer's compliance with the requirements of this Project.
- C. Source Limitations: Obtain each type of air barrier material, fluid-applied and sheet membrane, through one source from a single manufacturer.
- D. Installer Limitations: Each type of air barrier material, fluid-applied and sheet membrane, shall be installed by a single installation firm.
- E. All associated products used in conjunction with air barrier membranes and forming an integral part of the waterproofing system must meet the approval of the air barrier manufacturer and maintain applicable warranties.
- F. Mockups: Before beginning installation of air barrier, build mockups of exterior wall assembly, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, penetration and barrier flashings, terminations, and penetrations of air barrier membrane.

1. Mockup can be a designated area of the actual wall construction or a freestanding wall assembly mockup panel.
2. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.
3. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
4. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
5. If designated area of the actual wall construction is used as a mockup, the approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Preinstallation Conference: Conduct conference at Project site.

1. Include Owner, Architect, Installer, Manufacturer's technical representative, and installers of other construction affecting or connecting to air barrier, including roofing, waterproofing, architectural precast concrete, masonry, sealants, windows, glazed curtain walls, and door frames.
2. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in their original undamaged packages, with labels intact and legible.
- B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Store materials according to manufacturer's written instructions.
- E. Protect stored materials from direct sunlight.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.
 1. Apply materials when ambient temperature is above minimum temperature recommended by the manufacturer for a period of 24 hours prior to the application and when air temperature during the cure period is expected to remain above minimum temperature recommended by the manufacturer.
- B. Product selection shall be coordinated with construction sequence to ensure that manufacturer's exposure limits are adequate for anticipated schedule. Air barrier membrane exposed beyond the manufacturer's exposure limits shall be recoated, reinspected and reapproved at Contractor's own expense.

PART 2 - PRODUCTS

2.1 FLUID-APPLIED MEMBRANE AIR BARRIER

- A. High-Build, Vapor-Permeable Membrane Air Barrier: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions to meet physical and performance properties indicated, of 35 mils or thicker over smooth, void-free substrates.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing; Barritech VP.
 - b. GCP Applied Technologies; Perm-A-Barrier VP.
 - c. Henry Company; Air Bloc 17MR.
 - d. Master Builders Solutions; MasterSeal AWB 600.
 - e. Meadows, W.R.; Air Shield LMP.
 - f. Soprema; SopraSeal LM 204 VP.
 - g. Sto Corporation; AirSeal.
 - h. Tremco Incorporated; ExoAir 230.
 2. Physical and Performance Properties:
 - a. Membrane Air Permeance: Not to exceed 0.004 cfm/ sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
 - b. Membrane Vapor Permeance: Not less than 10.5 perms; ASTM E 96.

2.2 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of air barrier material.
- C. Barrier Flashing: Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.
- D. Elastomeric Flashing Sheet: ASTM D 2000, 2BC415 to 3BC620, minimum 50- to 65-mil- thick, cured sheet neoprene with manufacturer's recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.
- E. Counterflashing and Transition Strip: Modified bituminous, 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil- thick, crosslaminated polyethylene film with release liner backing.
- F. Joint Reinforcing Strip: Air barrier manufacturer's glass-fiber-mesh tape.
- G. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- H. Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- I. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.
- J. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.

- K. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- L. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
- M. 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."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer and Manufacturer's Technical Representative present, for compliance with requirements and other conditions affecting performance.
 - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - 2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
 - 3. Verify that concrete is visibly dry and free of moisture. Test concrete substrates for moisture using method as recommended in writing by air barrier manufacturer.
 - 4. Verify that masonry joints are flush and completely filled with mortar.
 - 5. 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. 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 in concrete with substrate patching membrane.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. 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.
- G. 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.

3.3 JOINT TREATMENT

- A. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and with air barrier manufacturer's written instructions. Apply first layer of fluid air barrier membrane at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air barrier membrane over joint reinforcing strip.

3.4 FLASHING INSTALLATION

- A. Install flashings and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
 - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - 2. Protect air barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, PVC membranes, and sealants not approved by air barrier manufacturer.
- B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.
 - 1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Penetration Flashing: Apply penetration flashing at all openings and penetrations so that a minimum of 3 inches of coverage is achieved over both substrates.
- D. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.
- E. Barrier Flashing: Apply barrier flashing to connect and seal exterior wall air barrier membrane continuously to perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations.
- F. Install transition strip, of compatible material, over roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over both substrates.
- G. 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.
- H. Seal flashings around masonry reinforcing or ties and penetrations with termination mastic.
- I. Seal top of through-wall flashings to air barrier with an additional 6-inch wide, counterflashing strip.
- J. Seal exposed edges of flashings at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- K. Repair punctures, voids, and deficient lapped seams in flashings. Slit and flatten fishmouths and blisters. Patch with flashings extending 6 inches beyond repaired areas in strip direction.
- L. At end of each working day, seal top edge of flashings to substrate with termination mastic.

3.5 AIR BARRIER MEMBRANE INSTALLATION

- A. Begin application in presence of, and after the Manufacturer's Technical Representative has approved mockup. Commencement of application constitutes Contractor's acceptance of substrates and conditions.
- B. Apply air barrier membrane to form a seal with flashings and to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
- C. Apply air barrier membrane within manufacturer's recommended application temperature ranges.
- D. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.
 - 1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- E. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.
 - 1. Vapor-Permeable, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils, applied in one or more equal coats.
 - a. Thin mil product will not be acceptable.
- F. Apply flashings over cured air barrier membrane overlapping 3 inches onto each surface according to air barrier manufacturer's written instructions.
- G. Do not cover air barrier until it has been inspected by Owner's testing agency.
- H. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.6 FIELD QUALITY CONTROL

- A. Contractor/Installer Testing: Installer shall have a wet film thickness gauge at all times during application and shall periodically check thickness of membrane during application with wet film thickness gauge.
- B. Manufacturer's Technical Representative: Contractor will engage a qualified Manufacturer's Technical Representative for a minimum of two full-time days to perform on-site inspections and prepare reports.
 - 1. Manufacturer's representative shall conduct inspections at start of installation, twenty-five percent complete, fifty percent complete and final, with reports to Architect. Deficiencies shall be listed on the inspection reports and repairs/corrections certified completed with next or final report.
- C. Inspections: Air barrier materials 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. Continuous structural support of air barrier system has been provided.
 - 3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
 - 4. Site conditions for application temperature and dryness of substrates have been maintained.
 - 5. Maximum exposure time of materials to UV deterioration has not been exceeded.
 - 6. Surfaces have been primed, if applicable.

7. Laps in flashings have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Flashings have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

D. Remove and replace deficient air barrier components and reinspect as specified above.

3.7 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. Remove and replace air barrier showing signs of deterioration or when left exposed beyond manufacturer's approved exposure limitation.
- 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 air barrier installation is complete.

END OF SECTION 072726

SECTION 074113 - STANDING-SEAM METAL ROOF 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.

1.2 SUMMARY

- A. Section includes:
 - 1. Standing Seam Metal Roof Panels
 - 2. Underlayment
- B. Related Requirements:
 - 1. Section 072221 "Roof Insulation and Cover Board"
 - 2. Section 076200 "Sheet Metal Flashing and Trim".

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 each type of panel and accessory.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; panel clip spacing, 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.
- C. 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.
- D. Materials List: Give written notification of the brand name and manufacturer of each material proposed for use and include a statement that all proposed materials meet the specifications requirements. Obtain approval prior to placing orders.
- E. Submittal of catalog cut sheets, etc. in lieu of the materials list required above is not acceptable. Do not submit cut sheets, etc. unless specifically requested.
- F. Uplift Calculations: Provide uplift and fastener calculations sealed by a Professional Engineer licensed in the State of North Carolina.
- G. Manufacturers standard prefinished color chart.

H. Manufacturer Certificates:

1. Signed by roofing manufacturer certifying that roofing system complies with the requirements specified in "Performance Requirements" Article.
2. Original document signed by a responsible officer of the manufacturing firm, notarized, on manufacturer's standard letterhead, certifying materials furnished for project comply with the referenced standard. Certificate shall specifically reference the project and applicable compliance standard.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Provide as part of closeout documents a complete list of maintenance items as required by the manufacturer's warranty, including roof inspections and sample inspection form bound in a 3-ring binder labeled roof maintenance manual.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 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.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 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: 30 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: 30-years from date of Substantial Completion.
- C. Special Weather-tightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weather-tight, including leaks, within specified warranty period.
 - 1. Warranty Period: 30-years from date of Substantial Completion.
 - a. Warranty to be No Dollar Limit (NDL) for full 30-year term.
- D. Installer's Warranty: Installer's Warranty on form included in these specifications, signed by roofing installer, properly executed and printed on Installer's letterhead form.
 - 1. Warranty Period: Five Years from date of Final Completion.
 - 2. The roofing contractor shall guarantee its materials and workmanship associated with the roofing, flashings and sheet metal work incidental to the work required under the contract, against defect due to faulty materials or workmanship for a period of five (5) years from the state of completion of such work. It is understood and agreed by all parties hereto that the responsibility of the roofing contractor under this guarantee (in the form provided in these specifications) or any contract documents shall be limited to the limited guarantee herein expressed by said roofing contractor.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Wind Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift resistance class indicated. Comply with the N. Carolina State Building Code (ASCE-7).
 - 1. Uplift Rating: UL 90.
- B. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592.
- C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 at the following test pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft.
- D. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - 1. Uniform pressure as indicated on Drawings.
- E. Snow Loads: 20 psf.
- F. Thermal Movements: Provide metal roof panel assemblies 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 joint sealants, 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-degree F, ambient; 180-degree F, material surfaces.
- G. UL Listing: Provide metal roof panels that meet the requirements of a UL Class A assembly.
- H. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft.
- I. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

2.2 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips inside laps. Include clips, cleats, pressure plates, and accessories required for weather-tight installation.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

1. Manufacturers: Subject to compliance with the Basis of Design requirements, provide one of the following manufacturers:
 - a. Basis of Design: Dimensional Metals, Inc. (DMI), Interlock IL2016, with 16" seam spacing and High bead panel type. Gutters shall have a rectangular profile with rectangular downspouts in colors that match the metal panels. Panel color is to be: DMI's STONE (SRI-49).
 - b. AEP-Span.
 - c. Architectural Metal Systems.
 - d. MBCI.
 - e. McElroy Metal, Inc.
2. Metallic-Coated Steel Sheet (Galvalume): Aluminum-zinc alloy-coated steel sheet complying with ASTM A 792, Class AZ50 coating designation; structural quality. Pre-painted by the coil-coating process to comply with ASTM A 755/A.
 - a. Nominal Thickness: 22 gauge.
 - b. Exterior Finish: Two-coat fluoropolymer.
3. Clips: Two-piece floating to accommodate thermal movement.
 - a. Material: 0.064-inch nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
4. Joint Type: Interlocking.
5. Panel Coverage: 16 inches.
6. Panel Height: 1.75 inches.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30-mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
 1. Thermal Stability: Stable after testing at 240-degree F; ASTM D 1970.
 2. Low-Temperature Flexibility: Passes after testing at minus 20-degree F; ASTM D 1970.
 3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Grace Construction Products, a unit of W. R. Grace & Co.; Grace Ice and Water Shield HT.
 - b. Henry Company; Blueskin PE200 HT.
 - c. Kirsch Building Products, LLC; Sharkskin Ultra SA.
 - d. Metal-Fab Manufacturing, LLC; MetShield.
- B. Slip Sheet: Manufacturer's recommended slip-sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

- A. Panel Accessories: Provide components required for a complete, weather-tight panel system including trim, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.

2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch thick, flexible closure strips; cut or pre-molded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weather-tight construction.
 3. Snow Guards: Provide snow guards at eaves, over entrances, walkways, and adjacent metal roof areas. Provide snow guards that attach to metal roof panel seams. Snow guards shall not penetrate or be adhered to metal roof panels. Basis of Design: Colorgard by Unistrut Service Company.
 4. Roof Fall Restraint Anchors: Provide fall restraint tie-offs at locations as directed by the Roofing Consultant. Type and installation details are to be submitted for Architect's review. Provide technical structural information and mounting requirements. Basis of Design: 3M DBI-SALA, E-Maxi Clamp for a double lock seam.
- B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- C. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- D. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are non-staining, 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, non-sag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.
 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weather-tight; and as recommended in writing by metal panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.
- E. Bearing Plates: 6" x 6" ga. as required by roofing system manufacturer.

2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weather-tight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
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. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 3. Conceal fasteners and expansion provisions where 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 panel 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: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- 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.

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. 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 sub-framing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24- inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
 1. Apply over the entire roof surface.

3.4 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations 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. 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 clips in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Fix panels at mid-span with non-moving clips.
 7. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weather-tight escutcheons for pipe- and conduit-penetrating panels.
 9. Install 18- gauge galvanized steel bearing plates between panel clips and underlayment.
 10. Install panels continuous from ridge to eave.
- 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. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions. Secure panels with 2 fasteners per clip.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
1. Install clips to supports with self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Interlocking Joint: Join seams together per manufacturer's requirements.
 4. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
- F. Accessory Installation: Install accessories with positive anchorage to building and weather-tight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.
- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10-feet with no joints allowed within 24-inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with mastic sealant (concealed within joints).

3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories. Report results in writing.
 1. Provide three (3) inspections, including Final.
- B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare inspection reports.

3.7 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. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.8 ATTACHMENTS

- A. Roof System Installer Warranty's.

END OF SECTION 074113

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SECTION 074213 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concealed-fastener, lap-seam metal wall and soffit panels.

1.2 DEFINITION

- A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete wall system.

1.3 ACTION 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 type of wall panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory-, shop- and field-assembled work. Shop drawings shall be prepared by panel manufacturer.
 1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
 - a. Flashing and trim.
 - b. Anchorage systems.
- C. Samples: For the following products, prepared on Samples of size indicated below.
 1. Metal Wall Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal wall panel accessories.
 2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
 3. Accessories: 12-inch long Samples for each type of accessory.
- D. Delegated-Design Submittal: For metal wall panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:
 1. Wall panels and attachments.
 2. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
 3. Penetrations of wall by pipes and utilities.
- B. Qualification Data: Submit name and qualification data for Panel Fabricator/Installer and Manufacturer, indicating full compliance with specification requirements. Manufacturers who are not able to provide this information will or may be rejected. Architect and Owner reserve the right to reject Panel

Fabricator/Installer and/or Manufacturer if documentation of full compliance with specifications is not provided.

1. Submit certificate from manufacturer certifying that Installer has been trained by the manufacturer and is an authorized/certified installer of the specific metal panels proposed for this Project.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- D. Field quality-control reports.
- E. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal wall panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of metal wall panel from single source from single manufacturer.
- B. Manufacturer Qualifications: A manufacturing firm that has specialized in the manufacture of metal wall panel systems of the type specified and has been in standard production of the types of panels specified for at least 10 years.
1. Manufacturer is responsible for the preparation of data for metal panels, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
 2. Manufacturer shall provide the technical inspection such that manufacturer's intent and contractor's efforts remain coordinated.
- C. Fabricator/Installer Qualifications: A qualified firm that is approved, authorized, or licensed by wall panel system manufacturer to fabricate and install manufacturer's product and that is eligible to receive manufacturer's special warranty.
1. The fabricator/installer shall demonstrate and offer written attested certification that he has fabricated and installed; a minimum of 10,000 sq. ft. per year for each of the past three years, of the material that he is bidding.
 - a. Fabrication and installation of other types of panels, or another manufacturer's goods is not considered as meeting the above requirement.
 - b. Fabricator/Installer shall have been in business under its present name for at least 5 years prior to the start of this project.
 - c. Fabricator/Installer shall have not filed for protection from creditors under any state or federal insolvency or debtor relief statutes or codes.
 2. The fabricator/installer shall substantiate a track record of the manufacturer's working with the fabricator/installer, for three consecutive years, and at a scale of operations cited above.
 3. The Crew Chief/Foreman, shall be physically on-site, directly supervising the Work, during the entire period of installation of panel system.
 4. Installation Crew Chief/Forman shall be trained and certified by the panel system manufacturer and shall have on their person an identification card, certifying completion of training and approval of the manufacturer for the system being installed. The installer shall have been actively installing the type of system defined in these specifications for a minimum of 3 years.

- D. Mockups: Build mockups, of each panel type, 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 wall and corner panel, as shown on Drawings; approximately ten feet by ten feet by full thickness, including insulation, supports, attachments, and accessories.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall 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 wall 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 will affect metal wall panels.
 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 7. Review temporary protection requirements for metal wall panel assembly during and after installation.
 8. Review wall panel observation and repair procedures after metal wall panel installation.
- F. Inspections: Make required notifications, secure required inspections and pay fees such that the specified systems warranty are assured at the time of completion of the Work.
1. Contractor and Manufacturer's assigned representative shall inspect and warrant the Work as a condition of acceptance.
 2. Manufacturer shall provide a technical representative for start-up of installation, and progress inspections at 25 percent, 50 percent, and a final inspection with reports to the Installer, General Contractor and Architect/Owner. Deficiencies shall be listed on the inspection reports and all repairs/corrections made and certified completed and approved with next and final report.
 3. Manufacturer's Final Completion/Warranty Inspection: Upon completion of the Work and prior to final payment, the metal panel manufacturer's representative, in the presence of the Owner and Architect, shall inspect the metal paneling Work. Discrepancies shall be recorded and immediately rectified. Final payment will not be issued until the manufacturer's representative has given his certification/approval of Work and close-out submittals, including Warranties and maintenance instructions, have been received by the Architect. Warranties issued prior to final inspection are not acceptable and shall not qualify for release of final payment for the wall panel system work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
- B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

- C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal wall panel for period of metal wall panel installation.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication, and indicate measurements on Shop Drawings.

1.9 COORDINATION

- A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of soffits, and other adjoining work to provide a secure and noncorrosive installation.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies 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: 2 years from date of Substantial Completion.
- B. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Design metal wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
 - 1. Professional engineer shall be legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.

- C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at the following test-pressure difference:
1. Test-Pressure Difference: 1.57 lbf/sq. ft.
- D. 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.
- E. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:
1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure as indicated on Drawings.
 2. Deflection Limits: Metal wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/180 of the span.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- G. Fire-Test-Response Characteristics: For exterior walls assemblies, provide components tested as indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
1. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.
 2. If acceptable to authorities having jurisdiction, provide engineering judgment by registered fire protection engineer in lieu of tested mockup.

2.2 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal wall panels designed to be attached to supports using concealed fasteners. Include attachment system components, miscellaneous metal framing, and accessories required for complete system.
1. Include manufacturer's standard perimeter trim with integral weather stripping, panel stiffeners, standoff panel clips, and anchor channels.
- B. Reveal-Joint, Concealed-Fastener Metal Wall Panels: Formed with vertical panel edges and flat pan between panel edges; with reveal joint between panels.
1. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or comparable products by one of the following:
 - a. ATAS International, Inc.; Versa-Seam (Basis of Design).
 - b. CENTRIA.
 - c. Elevate.
 - d. Fabral.
 - e. IMETCO.
 - f. MBCI.
 - g. Merchant & Evans.

- h. Metal Sales Manufacturing Corporation.
 - i. Morin; a Kingspan Group company
 - j. Petersen Aluminum Corporation (PAC-CLAD)
 2. Aluminum Sheet: Coil-coated sheet, ASTM B209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - a. Thickness: 0.040 inch.
 - b. Surface: Smooth, flat finish.
 - c. Exterior Finish: Metallic fluoropolymer.
 - d. Color: Custom color as selected by Architect.
 3. Panel Coverage: Nominal 12 inches.
 4. Panel Height: 1 inch.
 5. Panel Length: Continuous length panel for full height indicated on Drawings. Manufacturers requiring jointed panels to achieve full height are not acceptable.

2.3 FIELD-INSTALLED THERMAL INSULATION

- A. Mineral-Wool Board Insulation, Unfaced: ASTM C 612, Types IA and IB; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. Nominal density of 4.5 lb/cu. ft.

2.4 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Zee Clips: 0.079-inch nominal thickness.
- C. Base or Sill Angles: 0.079-inch nominal thickness.
- D. Hat-Shaped, Rigid Furring Channels:
 1. Nominal Thickness: 0.064 inch, or as required to meet performance requirements.
 2. Depth: As indicated.
- E. Cold-Rolled Furring Channels: Minimum 1/2-inch wide flange.
 1. Nominal Thickness: As required to meet performance requirements.
 2. Depth: 3/4 inch.
 3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.064 inch.
 4. 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.
- F. Z-Shaped Furring: With slotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, and depth required to fit insulation thickness indicated.
 1. Nominal Thickness: 0.064 inch.
- G. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.5 MISCELLANEOUS MATERIALS

- A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.
- B. Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.
1. Closures: Provide gasketed closures at eaves, rakes, and jambs, fabricated of same metal as metal wall panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
- C. Flashing and Trim: Formed from material matching metal wall panels. Provide flashing and trim 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, fascia, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.
- D. Panel Sealants:
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 wide and 1/8 inch thick.
 2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.6 FABRICATION

- A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, 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. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the 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. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 3. Conceal fasteners and expansion provisions where 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 by metal wall 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.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Aluminum Panels and Accessories:
 - 1. Metallic Fluoropolymer: AAMA 2605. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.
 - 1. Examine wall framing to verify that angles, channels, studs, 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.
 - 3. Verify that fluid-applied membrane air barrier has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
 - 4. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Framing: Install base angles, sills, furring, and other miscellaneous wall panel support members and anchorages according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

3.3 THERMAL INSULATION INSTALLATION

- A. Board Insulation: Extend insulation in thickness indicated to cover entire wall. Comply with installation requirements in Section 072100 "Thermal Insulation."

1. Erect insulation horizontally and hold in place with Z-shaped furring members. Attach furring members to substrate with screws spaced 24 inches o.c., or as required by wind loads.

3.4 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Factory-authorized representative shall be present at beginning of metal wall panel installation and shall remain on-site full-time for the first three days of installation.
 2. Shim or otherwise plumb substrates receiving metal wall panels.
 3. Flash and seal metal wall panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
 4. Install screw fasteners in predrilled holes.
 5. Locate and space fastenings in uniform vertical and horizontal alignment.
 6. Install flashing and trim as metal wall panel work proceeds.
 7. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
 8. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 9. Provide escutcheons for pipe and conduit penetrating exterior walls.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal wall panel manufacturer.
- C. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, 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."
- D. Lap-Seam Metal Wall Panels: Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
 1. 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.

3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building, and provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install components required for a complete metal wall panel assembly including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 1. Install exposed flashing and trim that is without excessive oil canning, 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 and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect and test completed metal wall panel installation, including accessories.
- C. Wall Panel Inspections: Wall panel system manufacturer's technical personnel and Owner's Testing Agency shall inspect wall panel installation as required in the Quality Assurance Article of this Section, and submit report to Architect.
 1. Provide written report to Architect of every inspection. Indicate non-complying work and describe in detail the corrective activities required.
 2. Notify Architect or Owner 48 hours in advance of date and time of final inspection.
- D. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
- E. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.
- B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213

SECTION 074223 - PHENOLIC WALL SIDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Exterior high pressure laminate cladding, factory fabricated plank panel system, and accessories as required for a drained and back-ventilated rainscreen wall system.
 - 1. Wall panels.

1.1 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: Submit plan, section, and elevation drawings necessary to describe and convey the layout, profiles and product components, including edge conditions, panel joints, fixture location, anchorage, accessories, finish colors, patterns and textures.
- C. Samples: For each type of exposed finish, prepared on Samples a minimum of 3.5 inches by 3.5 inches representing actual product, color, and patterns.

1.2 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Delegated Design: Submit engineering calculations as required by the local building code, showing that the installed panels and attachments system meets the wind load requirements for the project.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For phenolic panels to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary panel products shall be supplied by a single manufacturer with a minimum of ten years experience.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- C. Mock-Up: Provide a mock-up for evaluation of the product and application workmanship.
 - 1. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Final Acceptance.
- D. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, testing and inspecting agency representative, panel Installer, panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects 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 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 will affect panels.
 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 7. Review temporary protection requirements for panel assembly during and after installation.
 8. Review panel observation and repair procedures after panel installation.
- E. Inspections: Make required notifications, secure required inspections and pay fees such that the specified systems warranty are assured at the time of completion of the Work.
1. Contractor and Manufacturer's assigned representative shall inspect and warrant the Work as a condition of acceptance.
 2. Manufacturer shall provide a technical representative for start-up of installation, and progress inspections at 25 percent, 50 percent, and a final inspection with reports to the Installer, CMR and Architect/Owner. Deficiencies shall be listed on the inspection reports and all repairs/corrections made and certified completed and approved with next and final report.
 3. Manufacturer's Final Completion/Warranty Inspection: Upon completion of the Work and prior to final payment, the panel manufacturer's representative, in the presence of the Owner and Architect, shall inspect the paneling Work. Discrepancies shall be recorded and immediately rectified. Final payment will not be issued until the manufacturer's representative has given his certification/approval of Work and close-out submittals, including Warranties and maintenance instructions, have been received by the Architect. Warranties issued prior to final inspection are not acceptable and shall not qualify for release of final payment for the panel system work.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Deliver components, phenolic panels, and other manufactured items so as not to be damaged or deformed. Package phenolic panels for protection during transportation and handling.
 - B. Unload, store, and erect phenolic panels in a manner to prevent bending, warping, twisting, and surface damage.
 - C. Stack phenolic panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store phenolic panels to ensure dryness, with positive slope for drainage of water. Do not store phenolic panels in contact with other materials that might cause surface damage.
 - D. Retain strippable protective covering on phenolic panels during installation.
- 1.6 PROJECT CONDITIONS
- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
 - B. Field Measurements: Verify actual measurements/openings by field measurements performed by the installer prior to release for fabrication. Recorded measurements to be indicated on shop drawings based

on field measurements provided by the installer. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.7 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of phenolic wall panel systems that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or comparable product by one of the following:
1. Trespa International; Pura Flush Concealed System (Basis of Design).
 2. Abet Laminati.
 3. Formica VIVIX.
 4. FunderMax.

2.2 WALL SIDING SYSTEM

- A. Panel shall be manufactured to be used in conjunction with siding accessories and components to provide a cladding for a drained and back ventilated rainscreen wall system.
- B. Material: Solid panel manufactured using a combination of high pressure and temperature to create a flat panel created from thermosetting phenolic resins, homogenously reinforced with natural wood-based fibers and an integrated decorative surface.
1. Color: NFC PU08 Romantic Walnut.
 2. Finish: Matte sheen.
 3. Panel Core: Fire retardant (FR) core.
 4. Panel Thickness: 5/16 inch.
 5. Panel Weight: 2.4lb/ft²
 6. Physical Properties:
 - a. Modulus of Elasticity: 1,300,000 psi minimum, ISO 178.
 - b. Tensile Strength: 10,100 psi minimum, ISO 527-2.
 - c. Flexural Strength: 14,500psi minimum, ISO 178.
 7. Fire Performance:
 - a. Flame Spread: Class A, Less than 25, ASTM E 84.
 - b. Smoke Development: Less than 450, ASTM E 84.
 8. Finish Performance:
 - a. Resistance to Climactic Shock: EN 438-2:19.
 - b. Resistance to Artificial Weathering: EN 438-2:29.
 - c. Color Stability: The decorative surface to comply with, classification, 4 - 5 measured with the grey scale according to ISO 105 A02-93 according to test method EN 438-2:29.
 - d. Resistance to SO₂: DIN 50018.
 - e. Microbial Characteristics: Will not support micro-organic growth (ISO 846).
- C. Mounting System: Flush siding system.

D. Sub Structure:

1. Sub-structure designed to withstand structural loading due to wind load and the dead load of the panel, finished as required to conceal behind the joinery of the attachment system.
2. Extrusions, battens, including corner closures, joint closures and vent screens, formed members, sheet, and plate shall conform with the recommendations of the manufacturer.

E. Fasteners: Manufacturer's tested and approved non-corrosive concealed fasteners.

F. Accessories:

1. Extruded aluminum trim includes outside corners, inside corners, start profiles, j channel, and finish profiles.
 - a. Color: Match wall panels.

G. Code Compliance Requirement for Siding System

1. Complies with ASTM E 136 as a combustible material.
2. Complies with ASTM E 84
 - a. Flame Spread Index: 0,
 - b. Smoke Development Index: 15.
3. Tested to ASTM E 330 for Transverse Loads.
4. Compliant to IBC section 1409 for Building Types I-IV below 40' in height and any height for Building Type V.
5. Compliant to IRC chapter 7.

H. Thermal Insulation: Mineral-wool board insulation as specified in Section 072100 "Thermal Insulation."

2.3 FABRICATION

- A. Panels: Solid high-pressure laminate phenolic wall panels with no voids, air spaces or foamed insulation in the core material. Accessory items in accordance with manufacturer's recommendations and approved submittals. Panel edges are factory fabricated to be used with the provided hardware system.
- B. Panel Dimensions: Field fabrication shall be allowed where necessary but shall be kept to an absolute minimum.
 1. Flush Siding Dimensions: 5/16-inch thick, 7-3/8-inch tall, 10 feet length
- C. Appearance: Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, panel 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 wall panel manufacturer.
 2. Surfaces to receive panels shall be even, smooth, dry, and free from defects detrimental to the installation of the panel system.

- C. Confirm exterior sheathing is plumb and level, with no deflection greater than 1/4 inch over 20 feet span.
 - 1. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- D. Notify Architect of unsatisfactory preparation before proceeding.
 - 1. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install phenolic wall siding and sub-framing system in accordance with manufacturer's instructions and local building code
- B. Install phenolic wall siding plumb and level and accurately spaced in accordance with manufacturer's recommendations and approved submittals and drawings.
- C. Anchor siding panels and sub-framing securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary movement and structural support.
- D. Fasten siding panels with fasteners approved for use with supporting substrate.
- E. Do not install siding panels or component parts which are observed to be defective or damaged including, but not limited to: warped, bowed, abraded, scratched, and broken members.
- F. Do not cut or trim component system parts during installation in a manner that would damage the finish, decrease the strength, or result in visual imperfection or a failure in performance.
- G. Install corner profiles and trim with fasteners appropriate for use with adjoining construction as indicated on the Contract Drawings and as recommended by manufacturer.

3.4 ADJUSTING AND CLEANING

- A. Remove masking or panel protection after installation.
- B. Adjust final panel installation so that all joints are true and even throughout the installation. Panels out of plane shall be adjusted with the surrounding panels to minimize any imperfection.
- C. Repair panels with minor damage. Remove and replace panels damaged beyond repair as a direct result of the panel installation.
- D. Clean finished surfaces as recommended by panel manufacturer.

END OF SECTION 074223

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SECTION 074243 - METAL COMPOSITE WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concealed-fastener, metal-faced composite wall and soffit panels.

1.2 DEFINITION

- A. Metal-Faced Composite Wall and Soffit Panel Assembly: Metal-faced composite wall and soffit panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete wall and soffit system.

1.3 ACTION 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 type of metal composite panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal composite panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish among factory-, shop-, and field-assembled work. Shop drawings shall be prepared by panel manufacturer.
 - 1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
 - a. Flashing and trim.
 - b. Anchorage systems.
- C. Samples: For each type of exposed finish required.
 - 1. Metal Composite Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.
 - 2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
 - 3. Accessories: 12-inch long Samples for each type of accessory.
- D. Delegated-Design Submittal: For metal composite panel assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Exterior elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Metal composite panels and attachments.
 - 2. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
 - 3. Penetrations of wall by pipes and utilities.

- B. Qualification Data: Submit name and qualification data for Panel Fabricator/Installer and Manufacturer, indicating full compliance with specification requirements. Manufacturers who are not able to provide this information will or may be rejected. Architect and Owner reserve the right to reject Panel Fabricator/Installer and/or Manufacturer if documentation of full compliance with specifications is not provided.
1. Submit certificate from manufacturer certifying that Fabricator/Installer has been trained by the manufacturer and is an authorized/certified fabricator/installer of the specific metal composite panels proposed for this Project.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- D. Field quality-control reports.
- E. Warranties: Samples of special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal composite panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Metal composite panel work shall be directly sub-contracted by the General Contractor to a company that specializes in the installation of metal composite panels and has an on-going business relationship with the manufacturer, whose product is to be supplied for this project. Brokering or sub-subcontracting of metal composite panel work is unacceptable and will not be allowed.
- B. Manufacturer Qualifications: A manufacturing firm that has specialized in the manufacture of metal composite panel systems of the type specified and has been in standard production of the types of panels specified for at least 5 years.
1. Manufacturer is responsible for the preparation of data for metal panels, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
 2. Manufacturer shall provide the technical inspection such that manufacturer's intent and contractor's efforts remain coordinated.
- C. Fabricator/Installer Qualifications: A qualified firm that is approved, authorized, or licensed by metal composite panel system manufacturer to fabricate and install manufacturer's product and that is eligible to receive manufacturer's special warranty.
1. The fabricator/installer shall demonstrate and offer written attested certification that he has fabricated and installed; a minimum of 10,000 sq. ft. per year for each of the past three years, of the material that he is bidding.
 - a. Fabrication and installation of other types of panels, or another manufacturer's goods is not considered as meeting the above requirement.
 - b. Fabricator/Installer shall have been in business under its present name for at least 5 years prior to the start of this project.
 - c. Fabricator/Installer shall have not filed for protection from creditors under any state or federal insolvency or debtor relief statutes or codes.
 2. The fabricator/installer shall substantiate a track record of the manufacturer's working with the fabricator/installer, for three consecutive years, and at a scale of operations cited above.

3. The Crew Chief/Foreman, shall be physically on-site, directly supervising the Work, during the entire period of installation of panel system.
 4. Installation Crew Chief/Forman shall be trained and certified by the panel system manufacturer and shall have on their person an identification card, certifying completion of training and approval of the manufacturer for the system being installed. The installer shall have been actively installing the type of system defined in these specifications for a minimum of 3 years.
- D. Fire-Resistance Ratings: Where indicated, provide metal composite panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical wall and soffit panel as shown on Drawings; full thickness, including supports, attachments, and accessories.
 - a. Include four-way joint and full thickness, factory fabricated corners and attachments for metal composite panels.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Preinstallation Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal composite panel Installer, metal composite panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal composite 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 composite 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 will affect metal composite panels.
 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 7. Review temporary protection requirements for metal composite panel assembly during and after installation.
 8. Review panel observation and repair procedures after metal composite panel installation.
- G. Inspections: Make required notifications, secure required inspections and pay fees such that the specified systems warranty are assured at the time of completion of the Work.
1. Contractor and Manufacturer's assigned representative shall inspect and warrant the Work as a condition of acceptance.
 2. Manufacturer shall provide a technical representative for start-up of installation, and progress inspections at 25 percent, 50 percent, and a final inspection with reports to the Installer, General Contractor and Architect/Owner. Deficiencies shall be listed on the inspection reports and all repairs/corrections made and certified completed and approved with next and final report.
 3. Manufacturer's Final Completion/Warranty Inspection: Upon completion of the Work and prior to final payment, the metal composite panel manufacturer's representative, in the presence of the Owner and Architect, shall inspect the metal composite paneling Work. Discrepancies shall be

recorded and immediately rectified. Final payment will not be issued until the manufacturer's representative has given his certification/approval of Work and close-out submittals, including Warranties and maintenance instructions, have been received by the Architect. Warranties issued prior to final inspection are not acceptable and shall not qualify for release of final payment for the metal composite panel system work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal composite panels, and other manufactured items so as not to be damaged or deformed. Package metal composite panels for protection during transportation and handling.
- B. Unload, store, and erect metal composite panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal composite 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 composite panels for period of metal panel installation.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal composite panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal composite panel fabrication, and indicate measurements on Shop Drawings.

1.9 COORDINATION

- A. Coordinate metal composite panel assemblies with rain drainage work, flashing, trim, and other adjoining work to provide a secure and noncorrosive installation.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite panel assemblies 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: 2 years from date of Substantial Completion.
- B. Special Warranty on Aluminum Composite Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite 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. General Performance: Metal composite panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Design metal composite panel assemblies, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
 1. Professional engineer shall be legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
- C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at the following test-pressure difference:
 1. Test-Pressure Difference: 1.57 lbf/sq. ft.
- D. 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.
- E. Structural Performance: Provide metal composite panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:
 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure as indicated on Drawings.
 2. Deflection Limits: Metal composite panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/175 of the span at the perimeter and 1/60 of the span anywhere in the panel.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- G. Fire-Test-Response Characteristics: For exterior walls assemblies, provide components tested as indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 1. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.
 2. If acceptable to authorities having jurisdiction, provide engineering judgment by registered fire protection engineer in lieu of tested mockup.

2.2 PANEL MATERIALS

- A. Aluminum Composite Material: Provide factory-formed and -assembled, aluminum-faced composite panels fabricated from two 0.020-inch thick, coil-coated aluminum sheet facings bonded, using no glues or adhesives, to solid, extruded thermoplastic core; formed into profile indicated.
1. 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.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. PAC-CLAD; PAC-3000 RS (Basis-of-Design).
 - b. 3A Composites USA; Alucobond Plus.
 - c. Alcoa Inc.; Reynobond FR.
 - d. Alucoil; Intrabond FR.
 - e. East Coast Metal Systems.
 - f. Mitsubishi Chemical America, Inc.; ALPOLIC FR.
 3. Surface: Smooth, flat finish.
 4. Panel Thickness: 0.157 inch.
 5. Core: Fire retardant.
 6. 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.

2.3 METAL-FACED COMPOSITE WALL PANELS

- A. General: Provide factory-formed metal wall panels designed to be attached to supports using concealed fasteners. Include attachment system components, miscellaneous metal framing, and accessories required for complete system.
1. Include manufacturer's standard perimeter extrusions with integral weather stripping, panel stiffeners, panel clips, and anchor channels.
- B. Reveal-Joint, Concealed-Fastener Aluminum Metal Wall Panels: Formed with vertical panel edges and flat pan between panel edges; with reveal joint between panels.
1. Material: Aluminum composite.
 - a. Application: Open and dry joint rainscreen system.
 2. Panel Coverage: As indicated on Drawings.
 3. Reveal Width: 1 inch.
 4. Panel Height: 1 inch.
 5. Exterior Finishes:
 - a. Metallic Fluoropolymer.
 - b. Color:
 - 1) MP-1: Berkshire Blue.
 - 2) MP-2: Arcadia Green.
 - 3) MP-4: Cityscape.

2.4 METAL-FACED COMPOSITE SOFFIT PANELS

- A. General: Provide factory-formed 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 and factory-applied sealant in side laps. Include attachment system components, miscellaneous metal framing, and accessories required for complete system.

1. Include manufacturer's standard perimeter extrusions with integral weather stripping, panel stiffeners, panel clips, and anchor channels.
- B. Flush-Profile, Concealed-Fastener Metal Soffit Panels (Panel SP-1): Solid panels formed with vertical panel edges and flat pan between panel edges; with flush joint between panels.
 1. Material: Aluminum composite.
 2. Panel Coverage: As indicated on Drawings.
 3. Panel Height: 1 inch.
 4. Exterior Finishes:
 - a. Metallic Fluoropolymer.
 - b. Color: Custom color as selected by Architect.

2.5 FIELD-INSTALLED THERMAL INSULATION

- A. Faced, Mineral-Wool Board Insulation: ASTM C 612; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers that is tested and approved for use in the panel system provided:
 - a. Fibrex Insulation Inc.
 - b. Isolatek International.
 - c. Owens Corning.
 - d. Roxul Inc.
 - e. Thermafiber
 - f. MonoThermROC by United States Fireproofing, LLC
 2. Facing Color: Black.

2.6 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Zee Clips: 0.079-inch nominal thickness.
- C. Base or Sill Angles: 0.079-inch nominal thickness.
- D. Hat-Shaped, Rigid Furring Channels:
 1. Nominal Thickness: 0.0312 inch, or as required to meet performance requirements.
 2. Depth: As indicated.
- E. Cold-Rolled Furring Channels: Minimum 1/2-inch wide flange.
 1. Nominal Thickness: As required to meet performance requirements.
 2. Depth: 3/4 inch.
 3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch.
 4. 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.
- F. Z-Shaped Furring: With slotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, and depth required to fit insulation thickness indicated.

1. Nominal Thickness: 0.0312 inch.

- G. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.7 MISCELLANEOUS MATERIALS

- A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal composite panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.8 ACCESSORIES

- A. Panel Accessories: Provide components required for a complete metal composite panel assembly including trim, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal composite panels, unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal composite panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

- B. Flashing and Trim: Formed from 0.040-inch minimum thickness, aluminum or zinc sheet to match adjacent metal composite panels. Provide flashing and trim 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, fascia, parapet caps, soffits, reveals, and fillers.

2.9 FABRICATION

- A. General: Fabricate and finish metal composite panels and accessories at the factory to greatest extent possible, 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. Metal Composite Panels: Factory form panels in a continuous process with no glues or adhesives between dissimilar materials. Trim and square edges of sheets with no displacement of face sheets or protrusion of core material.

1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
2. Fabricate panels with sharply cut edges, with no displacement of face sheets or protrusion of core material.
3. Fabricate panels with panel stiffeners, as required to comply with deflection limits, attached to back of panels with structural silicone sealant or bond tape.
4. Dimensional Tolerances:
 - a. Panel Bow: 0.8 percent maximum of panel length or width.
 - b. Squareness: 0.25 inch maximum.

- C. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant 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 by metal composite panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal composite panel manufacturer for application, but not less than thickness of metal being secured.

2.10 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.11 ALUMINUM FINISHES

- A. Metallic Fluoropolymer: AAMA 2605. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal composite panel supports, and other conditions affecting performance of the Work.
 1. Examine wall framing to verify that angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal composite 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 composite panel manufacturer.
 3. Verify that fluid-applied membrane air barrier has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
 4. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

- B. Examine roughing-in for components and systems penetrating metal composite panels to verify actual locations of penetrations relative to seam locations of panels before panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Framing: Install base angles, sills, furring, and other miscellaneous panel support members and anchorage according to ASTM C 754 and metal composite panel manufacturer's written instructions.
 - 1. Soffit Framing: Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 THERMAL INSULATION INSTALLATION

- A. Board Insulation: Extend insulation in thickness indicated to cover entire wall. Comply with installation requirements in Section 072100 "Thermal Insulation."
 - 1. Erect insulation horizontally and hold in place with Z-shaped furring members. Attach furring members to substrate with screws spaced 24 inches o.c., or as required by wind loads.
 - 2. Retain insulation in place by metal clips and straps or integral pockets within panels, spaced at intervals according to insulation manufacturer's instructions. Maintain cavity width between insulation and metal liner panel of dimension indicated.

3.4 METAL-FACED COMPOSITE WALL PANEL INSTALLATION

- A. General: Install metal-faced composite wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Factory-authorized representative shall be present at beginning of metal composite panel installation and shall remain on-site full-time for the first three days of installation.
 - 2. Shim or otherwise plumb substrates receiving metal-faced composite panels.
 - 3. Flash and seal metal-faced composite panels at perimeter of all openings. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed.
 - 4. Install screw fasteners in predrilled holes.
 - 5. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 6. Install flashing and trim as metal panel work proceeds.
 - 7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 - 8. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
 - 9. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 - 10. Provide escutcheons for pipe and conduit penetrating exterior walls.
- B. Fasteners: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal-faced composite panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal composite panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by panel manufacturer.

1. Seal metal panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal panel manufacturer.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- E. Attachment System Installation, General: Install attachment system required to support metal composite panels and to provide a complete system, including perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.
1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
 2. Do not begin installation until weather barrier and flashings that will be concealed by composite panels are installed.
- F. Track-Support Installation: Provide manufacturer's standard horizontal and vertical tracks that provide support and complete secondary drainage system, draining to the exterior at horizontal joints. Install support system at locations, spacings, and with fasteners recommended by manufacturer. Attach panels to wall by interlocking tracks with perimeter extrusions attached to wall panels. Fully engage integral gaskets and leave horizontal and vertical joints with open reveal.
1. Attach routed-and-turned flanges of panels to perimeter extrusions with manufacturer's standard fasteners.
 2. Attach flush panels to perimeter extrusions by engaging panel edges and by attaching with manufacturer's standard structural silicone adhesive.
 3. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
 4. Do not apply sealants to joints unless otherwise indicated on Drawings.

3.5 METAL-FACED COMPOSITE SOFFIT PANEL INSTALLATION

- A. Metal Soffit Panels: Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.
1. Comply with requirements of "Metal-Faced Composite Wall Panel Installation" Article.
 2. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.

3.6 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal composite panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.
1. Install exposed flashing and trim that is without excessive oil canning, 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 and weather-resistant performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently

weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal composite panel units within installed tolerance of 1/4 inch in 20 feet, nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect and test completed metal composite panel installation, including accessories.
- C. Metal Composite Panel Inspections: Metal panel system manufacturer's technical personnel and Owner's Testing Agency shall inspect metal composite panel installation as required in the Quality Assurance Article of this Section, and submit report to Architect.
 - 1. Provide written report to Architect of every inspection. Indicate non-complying work and describe in detail the corrective activities required.
 - 2. Notify Architect or Owner 48 hours in advance of date and time of final inspection.
- D. Remove and replace metal composite panels where tests and inspections indicate that they do not comply with specified requirements.
- E. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal composite panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal composite panel installation, clean finished surfaces as recommended by panel manufacturer. Maintain in a clean condition during construction.
- B. After metal composite panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal composite panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074243

SECTION 075200 - MODIFIED BITUMINOUS MEMBRANE 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.

1.2 SUMMARY

- A. Section Includes:
 - 1. Styrene-butadiene-styrene (SBS) modified bituminous membrane roofing.
- B. Related Requirements:
 - 1. Section 035216 "Lightweight Insulating Concrete" for roof insulation.
 - 2. Section 061000 "Rough Carpentry for Roofs" for nailers and wood blocking.
 - 3. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
 - 4. Section 079201 "Sealants for Roofing" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.4 PRE-INSTALLATION MEETINGS

- A. Pre-Installation Roofing Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Roof Consultant, Owner's insurer if applicable, testing and inspecting agency representative, roofing installer, roofing system manufacturer's representative, deck 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. Review 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. Review method of storage of materials on the roof during construction.
 - 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.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
 - 1. Base flashings and membrane terminations.
 - 2. Base sheet fastening patterns for corner, perimeter, and field-of-roof locations.
 - 3. Tapered insulation layouts.
- C. Samples for Verification: For the following products:
 - 1. Cap sheet, of color required.
 - 2. Flashing sheet, of color required.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Manufacturer.
- B. Materials List: Give written notification of the brand name and manufacturer of each material proposed for use and include a statement that all proposed materials meet the specification requirements. Obtain approval prior to placing orders.
 - 1. Submittal of catalog cut sheets, etc. in lieu of the materials list required above is not acceptable. Do not submit cut sheets unless specifically requested.
- C. Installation Instructions: Submit manufacturer's latest written installation instructions.
- D. Manufacturer Certificates of Compliance: Original document signed by an authorized representative of the manufacturing firm, notarized, on manufacturer's standard letterhead, certifying materials furnished for project comply with the referenced standard. Certificate shall specifically reference the project and applicable compliance standard.
- E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of complying with performance requirements.
- F. Product Test Reports: For components of membrane roofing system, for tests performed by manufacturer and witnessed by a qualified testing agency.
- G. Research/Evaluation Reports: For components of membrane roofing system, from ICC-ES.
- H. Field Quality-Control reports. Copy of roofing system manufacturer's inspection reports.
- I. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for membrane 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. The roofing applicator shall have been actively installing roofs of equal or greater size, for a minimum of five (5) years for the roofing system defined in the specifications.
 - 2. The roofing applicator shall have on the job a foreman with a minimum of four (4) years of experience in the type of roofing work specified, whenever roofing and related flashing work is being done. Foreman shall be required to fully communicate in English.

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. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.
- D. Supply and keep all materials dry at all times prior to application/installation.
 - 1. Materials which have been prematurely exposed to the weather are subject to immediate removal and replacement with new materials at contractor's expense. Materials may be marked with paint or other indelible materials while they remain on-site.
- E. Store all roll goods on end on clean floors or platforms. Do not use flattened rolls or rolls with ends damaged.
- F. Store solvent bearing materials in dry, cool storage and keep lids tight on partially used containers to prevent escape of solvents.

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 roofing membrane, base flashings, roofing membrane accessories, lightweight insulating concrete, fasteners and other components of roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.
 - a. Warranty to be No Dollar Limit (NDL) for full 20-year term.
- 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 roofing system, but not limited to, membrane roofing, base flashing, roofing membrane accessories, fasteners, walkway products and sheet metal work, for the following warranty period:
 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. For purposes of these documents, the roof system manufacturer is defined as the manufacturer of the primary roof membrane. The roof system is intended to encompass, but is not necessarily limited to, all components above the deck including roof membrane, membrane flashings and any proprietary flashing/components of the system manufacturer. Subject to compliance with the material specifications of these documents, all materials are to be supplied by the same manufacturer.
- B. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Derbigum Americas, Inc.
 2. Johns Manville.
 3. Siplast, Inc.
 4. Soprema, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base 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. Roofing and base flashings shall remain watertight.
 1. Accelerated Weathering: Roofing system shall withstand 2,000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
 2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Design uplift pressures are to be verified by the manufacturer and must comply with the N. Carolina State Building Code. Contractor is to provide an FM RoofNav assembly number and the system must be tested by a qualified testing agency to resist the following uplift pressures (Follow ASCE 7-10 requirements). Refer to drawings for wind uplift pressures.

- D. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.3 ROOFING SHEET MATERIALS

- A. Vented Base Sheet (mechanically fastened to LWIC): ASTM D 4897/D 4897M, Type II, venting, non-perforated, heavyweight, asphalt-impregnated and -coated, glass-fiber base sheet with coarse granule surfacing or embossed venting channels on bottom surface.
- B. Roofing Membrane Sheet (Base Ply- Torch Applied): ASTM D 6164, Grade S, Type I, SBS-modified asphalt sheet (reinforced with polyester fibers); minimum 110 mils thick, smooth surfaced; suitable for application method specified.
- A. Granule-Surfaced Roofing Cap Sheet (Torch Applied): ASTM D 6163, Grade G, Type I or II, SBS-modified asphalt sheet (reinforced with glass fibers); minimum 130 mils thick, ceramic-coated surface granules; suitable for application method specified, and as follows:
 - 1. Granule Color: White.
 - 2. Owner and Architect to approve.

2.4 BASE FLASHING SHEET MATERIALS

- A. Base Ply: ASTM D 6164, Grade S, Type I, SBS-modified asphalt sheet (reinforced with polyester fabric); smooth surfaced; suitable for application method specified.
- B. Surfaced Flashing Cap Sheet: ASTM D 6298, SBS-modified asphalt sheet (reinforced with glass fabric); suitable for application method specified.

2.5 LIQUID MEMBRANE FLASHING MATERIALS

- A. Liquid Membrane Flashing System:
 - 1. Seamless Liquid Membrane: Polymethyl Methacrylate (PMMA), asphalt/urethane, or other proprietary technology.
 - 2. Reinforcing Mesh: Manufacturer's standard polyester fleece.
 - 3. Warranty: Included in Roofing System Warranty.

2.6 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
- B. Asphalt Primer: ASTM D 41/D 41M.
- C. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.

- D. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, non-skinning, and nondrying.
- E. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained on No. 40 sieve, color to match roofing cap sheet.
- F. Termination Bar: Extruded aluminum bar, 1 inch wide, 1/8 inch thick, with pre-punched holes at 6 inches on center.
- G. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.

2.7 FASTENERS

- A. Steel Roofing Nails: 11- or 12- gauge stainless steel with ringed shank, minimum 3/8- inch diameter head, and minimum 1.5- inch length.
- B. Masonry Anchors: Drive-pin fastener with alloy sleeve and stainless-steel nail insert for use in concrete, brick or concrete masonry units, 3/16- inch diameter, 2- inch length, mushroom head.
- C. Lightweight Concrete Base Sheet Fasteners: Coated, spread-type fasteners specifically made for attaching base sheet to lightweight concrete fill decks, 1.75-inch leg length, with 2-3/4-inch diameter, coated plates.

2.8 MISCELLANEOUS MATERIALS

- A. Self-Adhering Membrane: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30-mils thick, specifically designed to withstand high temperatures beneath metal roofing. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: Stable after testing at 220 deg F; ASTM D 1970.
 - 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970

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 lightweight insulating concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing 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 TORCH OPERATIONS

- A. Torch Operations: For a minimum of one hour following daily completion of torch applications, maintain a fire watch inside and outside the building in the area of torch application. Utilize a fully functional hand-held infrared device suitable for detecting areas of elevated temperature.
 - 1. Contractor shall always maintain two (2) fully operational fire extinguishers at the site.
 - 2. Take all measures necessary to protect flammable materials from open flames.
- B. All torch operations are to comply with Certified Roofing Torch Applicator (CERTA) and NRCA requirements. Torch operators shall be fully certified by CERTA. Contractor shall provide copy of certification for all torch applicators.

3.4 ROOFING INSTALLATION, GENERAL

- A. Comply with roofing system manufacturer's written instructions.
- B. Start installation of roofing in presence of manufacturer's technical personnel.
- C. Coordinate installation of roofing system so components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide weather tie-ins at end of each day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.5 BASE SHEET APPLICATION (LIGHTWEIGHT CONCRETE FILL)

- A. Clean deck surfaces of all dirt, dust, and other foreign matter.
- B. Apply next to deck one ply of rosin-sized sheathing paper Lap sides 4 inches and ends 6 inches.
- C. Starting low points in roof, apply one ply of specified base sheet perpendicular to slope, lapped at least 4 inches at sides and 6 inches at ends.
- D. Fasten base sheet with specified fasteners through steel plates into deck at the rated and patterns as required by the Roofing System Manufacturer for FM Roof Assemblies meeting or exceeding the specified wind uplift pressures. Provide additional perimeter and corner fastening as required to meet the wind uplift pressures specified.
- E. Terminate base sheet at face of all vertical surfaces.

3.6 MODIFIED BITUMINOUS MEMBRANE INSTALLATION

- A. Install modified bituminous roofing base ply and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
 - 1. Torch- apply to substrate.
 - 2. Unroll roofing sheets and allow them to relax for the minimum time period required by manufacturer.
 - 3. Cut rolls in maximum 18-foot lengths.
 - 4. Apply pressure on the sheet to ensure full contact with the substrate and complete adhesion.
- B. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
 - 1. Repair tears and voids in laps and lapped seams not completely sealed.
 - 2. Apply roofing granules to cover exuded bead at laps while bead is hot.
- C. Install roofing sheets so side and end laps shed water. (shingled pattern)
- D. Lap ends at least 6-inches and sides at least 3-inches.
- E. Stagger end laps a minimum of 3-feet.
- F. Where stripping plies are specified, they are to be installed prior to application of cap sheet. Where base flashings are specified, terminate cap sheet neatly along top of cant and apply base flashing over cap sheet.
- G. Check roof surface carefully for damage and application defects and make appropriate repairs and corrections.
- H. Starting at low point in roof, apply base ply. Apply uniformly and without voids. Press into full contact with substrate.
- I. Stagger side laps of base ply and cap sheet half the width of the sheet.

3.7 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
 - 1. Prime substrates with asphalt primer if required by roofing system manufacturer.
 - 2. Flashing-Sheet Application: Torch- apply flashing sheet to substrate.
- B. Extend base flashing up walls or parapets a minimum of 8-inches above roofing membrane and 4-inches onto field of roofing membrane.
- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing with termination bars.
 - 1. Seal top termination of base flashing.

- D. Install roofing cap-sheet stripping where metal flanges and edgings are set on roofing according to roofing system manufacturer's written instructions.
- E. Roof Drains: Apply 30-by-30-inch-PMMA flashing on completed roofing membrane. Cover flashing with roofing cap-sheet stripping, and extend a minimum of 4-inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
 - 1. Install stripping according to roofing system manufacturer's written instructions.
- F. Strip drain lead with one ply of base ply material in accordance with membrane manufacturer's latest printed instructions. Extend stripping a minimum of 12 inches beyond edge of lead.

3.8 LIQUID MEMBRANE FLASHING SYSTEM

- A. At flashing conditions less than 8-inches and greater than 4-inches, install liquid membrane flashing and reinforcement as specified herein.
 - 1. Follow manufacturer's latest printed installation instructions. Refer to Drawings. Submit to Roof Consultant prior to start of work.
 - 2. Prep surfaces as required by roofing system manufacturer. Install sealant to fill voids where roofing membranes terminate at penetrations.
 - 3. Using masking tape, mask the perimeter of the area to receive the flashing system. Apply resin primer to substrates requiring additional preparation and allow primer to set.
 - 4. Pre-cut fleece to ensure a proper fit at transitions and corners prior to membrane application.
 - 5. Apply an even, generous base coat of flashing resin using a roller at the minimum rate specified by the resin manufacturer to prepared surfaces requiring flashing coverage. Work the fleece into the wet, catalyzed resin using a brush or roller to fully embed the fleece in the resin and remove trapped air. Lap fleece layers a minimum of 2-inches and apply an additional coat of catalyzed resin between layers of overlapping fleece. Again, using a roller, apply an even top coat of catalyzed resin at the minimum rate specified by the resin manufacturer immediately following embedment of the fleece, ensuring full saturation of the fleece. Ensure that the flashing resin is applied to extend a 0.25-inch beyond the fleece. Remove the tape before the catalyzed resin sets. Make allowances for saturation of roller covers and application equipment.
 - 6. Should work be interrupted for more than 12 hours or the surface of the catalyzed resin becomes dirty or contaminated by the elements, wipe the surface to be lapped with new flashing resin using the specified cleaner/solvent. Allow the surface to dry for a minimum 20 minutes and a maximum 60 minutes before continuing work.

3.9 FIELD QUALITY CONTROL

- A. A technical representative of the roof system manufacturer shall conduct fastener pull tests on the lightweight insulating concrete before the base sheet is applied. Provide one fastener pull test for every 3,000 square feet of roofing or one day's work, whichever is smaller. The representative shall prepare a written report with the results of each pull test.
- B. A technical representative of the roof system manufacturer shall conduct periodic inspections throughout the course of the work. The representative shall prepare a written report for each inspection and shall promptly provide a copy of each report to the Owner, Contractor and Architect. Each report shall note any deficiencies the representative observes which require correction. A minimum of six (6) inspections plus a Final inspection is required for this project.

- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
 - 1. Notify Architect, Roof Consultant, and Owner 48 hours in advance of date and time of inspection.
- D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- E. Roofing system will be considered defective if it does not pass inspections.
 - 1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 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, inspect roofing 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.

3.11 SCHEDULE

- A. Schedule of the primary roof components (described from the bottom up) for each roof area. Methods of installation and related materials are in other sections of these specifications.

Main Building
Metal deck (See structural drawings for depth and type)
Lightweight Insulating Concrete (R-30 min.)
Vented Base Sheet (mechanically attached)
Modified Bitumen membrane base ply (torch applied)
Modified Bitumen membrane cap sheet (torch applied)

END OF SECTION 075200

ROOFING INSTALLER'S WARRANTY

Owner: _____

Installer: _____

Location of Building: _____

Name of Building: _____

Roof Areas: _____

Date of Substantial Completion: _____

Know all men by these presents, that we, Installer as defined above, having installed roofing membrane, base flashings, roofing membrane accessories, fasteners and sheet metal work, and having accomplished certain other work on the roof areas identified above under contract between Owner and Contractor, warrant to Owner, with respect to said work that for a period of five (5) years from date of Substantial Completion of said work, the roofing including insulation, roofing membrane, flashings and sheet metal work, shall be absolutely watertight and free from all leaks, provided however that the following are excluded from this warranty:

Defects or failures resulting from abuse by the Owner.

Defects in design involving failure of (1) structural frame, (2) load-bearing walls, and (3) foundations.

Damage caused by fire, tornado, hail, hurricane, acts of God, wars riots or civil commotion.

We, Installer, agree that should any leaks occur in the roofing we will promptly remedy said leaks in a manner to restore the roof to a watertight condition by methods compatible to the system and acceptable under industry standards and general practice.

We, Installer, further agree that for a period of five (5) years from date of Substantial Completion referred to above, we will make repairs at no expense to the Owner, to any defects which may develop in the work including but not limited to blisters, wrinkles, ridges, splits, warped insulation and loose flashings in a manner compatible to the system and acceptable under industry standards and general practice.

IN WITNESS WHEREOF, we have caused this instrument to be duly executed, this

_____ day of _____, 20_____.

(Installer)

WITNESS:

by _____
President

Notary Public

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SECTION 075416 – PVC MEMBRANE 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.

1.2 SUMMARY

- A. Section Includes:

- 1. PVC membrane roofing.

- B. Related Requirements:

- 1. Section 061000 "Miscellaneous Rough Carpentry for Roof" for nailers, curbs and wood blocking.
- 2. Section 072221 "Roof Insulation and Cover Board" for insulation and cover board.
- 3. Section 076200 "Sheet Metal Flashing and Trim" for sheet metal flashing.
- 4. Section 079201 "Sealants for Roofing" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section, ASCE 7-10 Wind Uplift Design, RoofNav Assemblies and Factory Mutual (FM) data sheets.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Roofing Conference: Before starting roof deck construction, conduct the conference at Project site.

- 1. Meet with Owner, Terracon, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck 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, verify availability of materials, review installer's personnel, equipment, and facilities needed to make progress and avoid change orders and any potential delays.
- 4. Review deck substrate requirements for conditions and finishes, including pull-out test results, 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.
10. Review safety requirements for site and project.

1.5 ACTION SUBMITTALS

- A. Procedures: In accord with Division 1 requirements.
- B. Samples:
 1. Three (3) samples of each fastener type.
 2. Three strips of full roll width samples of each membrane sheet material.
 3. Three (3) 6 in. strip by full roll width samples of rigid and/or flexible flashing, including side/end-lap seams.
 4. Three (3) 6- inch X 6 inch or larger samples of each type of insulation board.
- C. Shop drawings: Drawings of typical roof and tapered insulation layout, fastening patterns and flashing details. Shop drawings shall diagram required insulation fastening pattern to include field of roof, corners, and perimeter per RoofNav.
- D. Product data: Manufacturer's latest edition of technical product data, installation instructions, and recommendations for each type of insulation and roofing product specified to include, but not limited to insulation, membrane, flashing, membrane and insulation adhesives, deck primers, and mechanical fasteners. Include data substantiating that materials comply with requirements, including certification of PVC scrim and content.
- E. Manufacturer's Instructions: Detailed application instructions for the roof system being installed, to include general and specific recommendations; product storage and handling; weather restrictions and parameters; and application requirements.
- F. Certificates: Submit evidence satisfactory to Owner that the proposed applicator is currently approved by the manufacturer of the roofing materials. Submit copies of current "Certificate of License" issued to roofing applicator by manufacturer.
- G. Submit evidence satisfactory to Owner that the proposed mechanical fasteners are approved by Factory Mutual for use under the specified conditions.
- H. Manufacturer's Notice of Intent to Issue Roof Warranty, prior to the use of any of the manufacturer's materials on the project.
- I. Reports: Prior to start of installing work of this Section, and as part of the required written report on the Pre-Application Roofing Conference, submit a written and detailed step-by-step description of the methods of installation as agreed to in the Pre-Installation Roofing Conference.
- J. Submit copies of UL and FM test reports verifying materials and systems compliance with specified requirements.
- K. Roofing system to be FM approved, FM 1-90, Class A minimum or higher as required.
- L. Provide (FM) RoofNav number for the FM approved roof assembly.
- M. Product Data: For each type of product.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Materials List: Give written notification of the brand name and manufacturer of each material proposed for use and include a statement that all proposed materials meet the specification requirements. Obtain approval prior to placing orders.
 - 1. Submittal of catalog cut sheets, etc. in lieu of the materials list required above is not acceptable. Do not submit cut sheets unless specifically requested.
- C. Installation Instructions: Submit manufacturer's latest written installation instructions.
- D. Manufacturer Certificates of Compliance: Original document signed by an authorized representative of the manufacturing firm, notarized, on manufacturer's standard letterhead, certifying materials furnished for project comply with the referenced standard. Certificate shall specifically reference the project and applicable compliance standard.
- E. Polyisocyanurate Insulation Certificate of Compliance: Original document signed by an authorized representative of the manufacturing firm, notarized, on manufacturer's standard letterhead, certifying polyisocyanurate insulation shipped to this project complies with requirements listed in Part 2. Certificate shall specifically reference the project and applicable compliance standard.
- F. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of complying with performance requirements.
- G. Product Test Reports: For components of membrane roofing system, for tests performed by manufacturer and witnessed by a qualified testing agency.
- H. Research/Evaluation Reports: For components of membrane roofing system, from ICC-ES.
- I. Field quality-control reports. Copy of roofing system manufacturer's inspection reports.
- J. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is FM Global approved for membrane roofing system identical to that used for this Project.
- B. Installer Qualifications: A single installer (roofer) must perform the work of this Section and have not less than 5 years of successful experience in installation of roofing systems similar to those specified for this project and which is acceptable to and approved and/or licensed by manufacturer of primary roofing materials.

- C. Obtain written certification from manufacturer of roofing system certifying that installer is approved by manufacturer for installation of specified roofing system and approved at a level capable of providing the specified Warranty. Provide copy of certification to Owner prior to pre-application roofing conference.
- D. Installer must maintain full-time supervisor/foreman on job site during times that roofing is in progress. Supervisor must have minimum of 5 years of experience in roofing work of similar nature and scope as specified roofing.

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.
- E. Supply and keep all materials dry at all times prior to application.
 - 1. Materials which have been prematurely exposed to the weather are subject to immediate removal and replacement with new materials at contractor's expense. Materials may be marked with paint or other indelible materials while they remain on-site.
- F. Store all insulation, insulating board cants, tapered edge strip in dry, covered storage, or on platforms, and with weatherproof, breathable coverings such as heavy canvas. Insulation wrappers are not sufficient. Materials which are not stored under specified covers are subject to removal from the site.
- G. Store all roll goods on end on clean floors or platforms. Do not use flattened rolls or rolls with ends damaged.
- H. Store cartons and drums of adhesive on a level surface, in an upright position. Do not stack cartons. Protect open top containers from dirt and precipitation.
- I. Store solvent bearing materials in dry, cool storage and keep lids tight on partially used containers to prevent escape of solvents.
- J. Sequencing: Coordinate the work with other trades to ensure that components which are to be secured to or stripped into the roofing system are available and that permanent flashing and counterflashing are installed as the work progresses. Ensure temporary protection measures are in place to preclude moisture intrusion or damage to installed materials. Application of roofing shall immediately follow application of insulation as a continuous operation. Roofing operations shall be coordinated with insulation work so that all roof insulation applied each day is covered with roof membrane installation the same day.

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.
- B. Protection: Protect surfaces not intended to receive roofing materials from spillage, dripping, spotting and damage during application of the roofing. Should protection not be effective, or not be provided, restore the respective surfaces to their proper conditions by cleaning, repairing, or replacing, as applicable for the circumstances and as directed by Owner.
- C. Immediately protect completed portions of roofing from damage of subsequent construction activities in accord with contract requirements. Repair, replace, or as otherwise required to remedy any damage to roofing resulting from construction activities, for the entire duration of construction.

1.11 WARRANTY

- A. Roofing Manufacturer's Warranty:
 - 1. Written Warranty: Total System Warranty covering both labor and material with no dollar limitation.
 - 2. Total systems Warranty shall include flashing endorsement signed by an officer of roofing materials manufacturer's company, agreeing to repair or replace the roofing system and damaged roof materials, from penetration of water through the roof membrane for a period of 20-years following the Date of Substantial Completion, without additional cost to Owner. Include wind rider Warranty for the specified FM wind loads in construction documents and project manual. Roof Warranty shall meet wind load criteria of FM roofnav. The Warranty shall include the following additional items:
 - a) The Warranty must be non-prorated and must not exclude coverage due to ponding water.
 - b) Roofing inspection by a technical representative of the roofing membrane manufacturer 18-20 months after date of Final Acceptance. The technical representative shall provide a report of the inspection to the Owner no later than 60 days after the inspection.
 - c) Roofing manufacturer shall provide unlimited repairs during the Warranty period with no cost limitation.
 - d) Temporary emergency repairs may be made by Owner without voiding Warranty provisions. Permanent repairs shall be made in accordance with the requirements of the roofing membrane manufacturer.
 - e) A copy of the Record Document Roof Plan Drawings, Roof Detail Drawings, and Record PVC Specification Section shall be attached to the Warranty.
- B. The roofing sub-contractor shall provide a two-year Warranty. At a minimum, the roofing sub-contractor Warranty shall include the following:
 - 1. Sub-Contractor name, address, phone number and project contact name.
 - 2. The project completion date, and date of Warranty expiration.
 - 3. The contractor guarantee shall include, in writing, all project work, workmanship, and/or all materials installed by the contractor or subcontractors to be of a quality that will comply with all project specific requirements of the Construction Documents and other documents governing the specified work and workmanship through the guarantee period.
 - 4. The contractor shall investigate roof leaks during the guarantee period within a reasonable period, but in no instance greater than 24-hours after notification of a leak. The sub-contractor shall repair leaks determined to be the cause of the specified work at no cost to the Owner.

1.12 DESIGN AND PERFORMANCE CRITERIA

- A. Roofing to be FM I-90, Class A minimum.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Roofing Membrane Ply: A smooth-surface roof membrane consisting of one ply of a prefabricated, polyester scrim-reinforced, polyvinyl chloride (PVC) membrane. The roof system shall meet or exceed the minimum criteria established by ASTM D4434 Standard Specification for Poly(Vinyl Chloride) Sheet Roofing (Type III). The minimum thickness of the roof membrane shall be 60-mils as established by ASTM D751 Standard Test Method for Coated Fabrics. The minimum thickness of the roof membrane over the reinforcement scrim shall be 27-mils as established by ASTM D7635 Standard Test Method for Measurement of Thickness of Coatings Over Fabric Reinforcement.
- B. Flashing Ply (smooth): A smooth-surface roof membrane consisting of one ply of a prefabricated, polyester scrim-reinforced, polyvinyl chloride (PVC) membrane. The roof system shall meet or exceed the minimum criteria established by ASTM D4434 Standard Specification for Poly(Vinyl Chloride) Sheet Roofing (Type III). The minimum thickness of the flashing membrane shall be 60-mils, as established by ASTM D751 Standard Test Method for Coated Fabrics. The minimum thickness of the flashing membrane over the reinforcement scrim shall be 27-mils, as established by ASTM D7635 Standard Test Method for Measurement of Thickness of Coatings Over Fabric Reinforcement.

2.2 ROOFING ACCESSORIES

- A. Adhesives
1. Smooth PVC Membrane Adhesive: A solvent-based, low VOC, rubberized adhesive designed for bonding PVC single-ply roofing membranes and flashings to various roofing substrates.
- B. Sealant: A solvent-based, UV resistant synthetic elastomeric sealant for the completion of details.
- C. Water Block: A single component butyl-based high viscosity sealant for sealing the flashing membrane to the substrate behind exposed termination bars, flashing boots, and drain flanges.
- D. Membrane Conditioner/Cleaner: A solvent-based agent used to clean exposed or contaminated seams prior to heat welding to remove any residue that may compromise lap welding.
- E. PVC Membrane Flashing Accessories
1. Outside Corner Flashing: A molded PVC membrane having a thickness of 0.075 inch, designed to accommodate outside corners of base and curb flashing details. The molded flashing component shall be hot air welded directly to the specified PVC membrane.
 2. Inside Corner Flashing: A molded PVC membrane designed to accommodate inside corners of base and curb flashing details. The molded flashing component shall be hot air welded directly to the specified PVC membrane.
 3. Fluted Corner Flashing: A molded PVC membrane having a thickness of 0.055 inch, designed to accommodate corners of base and curb flashing details having dimensions that cannot be addressed using

standard pre-formed PVC inside or outside corner flashing components. The molded flashing component shall be hot air welded directly to the specified PVC membrane.

4. Flashing Strip: An 8-inch wide molded PVC membrane strip having a thickness of 0.045 inch, designed for general repairs and to strip-in PVC coated metal flanges.
5. Termination Bar with Receiver: An extruded aluminum termination bar with rounded edges and an angled sealant receiver and lower leg bulb stiffener, having factory-punched, slotted holes spaced on 6-inch centers.
6. Pre-formed Vent Boots: A molded PVC membrane used to flash pipe and conduit penetrations having a diameter of 1 to 6 inches. The pre-formed vent boots shall be hot air welded directly to the PVC roof membrane.
7. Cover Patches at T-Joints: A molded PVC membrane used to reinforce the T-joints of the specified PVC membrane system.

G. Fasteners

1. Insulation and Membrane Fasteners: Insulation fasteners and plates shall be FM Approved, and/or approved by the manufacturer of the primary roofing products. The insulation fasteners shall provide attachment required to meet the specified uplift performance and to restrain the insulation panels against the potential for ridging. The fastening pattern for each insulation panel to be used shall be as recommended by the insulation manufacturer and approved by the manufacturer of the primary roofing products. Acceptable insulation fastener manufacturers for specific deck types are listed below.
 - a. Metal Deck: Mechanical fasteners for metal decks shall be factory coated for corrosion resistance. The fasteners shall meet or exceed Factory Mutual Standard 4470 and when subjected to 30 Kesternich cycles, show less than 15% red rust. Acceptable fastener types for metal decks are listed below.
 - b. A fluorocarbon coated screw type roofing fastener having a minimum 0.230- inch thread diameter, used in conjunction with the specified seam plate.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Power sweep and/or vacuum all surfaces, removing all loose aggregate and foreign substances prior to commencement of roofing.

3.2 SUBSTRATE PREPARATION

- A. Rigid Insulation: Install insulation panels with the edges of the panels in moderate contact without forcing. Align fasteners within each row evenly across the panel and to achieve the proper embedment depth, without leaning or tilting.

3.3 ROOF MEMBRANE INSTALLATION

- A. Membrane Application: Apply roofing in accordance with roofing system manufacturer's instructions and the following requirements. Application of roofing membrane components shall immediately follow application of base sheet and/or insulation as a continuous operation.
- B. Aesthetic Considerations: Construction of an aesthetically pleasing overall appearance of the finished roof application is a standard requirement for this project. Make necessary preparations, utilize recommended application techniques, apply the specified materials and exercise care in ensuring that the finished application is acceptable to the Owner.
- C. Membrane Adhesive Application: Membrane adhesive can be applied by roller. Apply cold adhesive in a smooth, even, continuous layer without breaks or voids. Utilize an application rate as published by the roof membrane manufacturer.
- D. Roofing Application: Apply roofing to be free of wrinkles, creases or fishmouths. Use a blower and/or broom to remove any dirt or debris from the substrate surface. Heat-weld all laps of the roof membrane immediately after it is rolled out. Using the thermal induction equipment as recommended by the manufacturer, adhere the roof membrane to the underlying specified PVC-coated plates.
1. Apply all sheets of roofing with the side laps running perpendicular to the standing seams and parallel with the purlins.
 2. Using scissors, round all exposed sheet corners a minimum of 1-inch. Reference the manufacturer's installer guide for specific information as it pertains to sheet layout and orientation.
 3. Clean the laps of membrane that have become dirty or contaminated using the specified conditioner. Heat weld all side and end laps of the membrane during each day's application. All welds must be continuous, without voids, and free of burns and scorch marks. Weld shall be a minimum width of 1-inch for automatic machine welding and 2-inches for hand welding. Contact the manufacturer of the heat-welding equipment for specific guidelines on operating the equipment. Hand-roll the side laps and head laps of the membrane behind the heat welder.
 4. Through the field of the roof, thermally fuse the membrane to the underlying PVC-coated plates using a heat induction welder that is specialized for the installation of the specified roof membrane system.
- E. Flashing Application - General: Locate all penetrations at least 24 inches from curbs, walls, and edges to provide access for proper application of the specified flashing materials. Reinforce all coated metal and membrane flashing corners using preformed corners or non-reinforced membrane. Hot-air weld all flashing membranes, accessories, and coated metal to have a minimum 2-inch hand-welded or minimum 1.5-inch automatic machine-welded lap. Reference the manufacturer's standard details for all flashing conditions.
- F. Flashing Application - Coated Metal Flashings: Reference the manufacturer's standard details for all flashing conditions. Gap joints of coated metal edge, and flashing sections by 1/4-inch to allow for expansion and contraction. Apply 2-inch aluminum tape over the joint as a bond-breaker, to prevent welding in this area. Hot-air weld a 6-inch unsupported membrane flashing strip to both sides of the joint, with approximately 1-inch on either side of the joint left un-welded to allow for expansion and contraction. Lap all joints of coated metal sealant pans, scupper inserts, corners of roof edging and base flashing, or pop-rivet a separate metal piece to create a continuous flange condition. Hot-air weld a 6-inch strip of reinforced membrane flashing over all seams that will not be sealed during subsequent flashing installation.
- G. Reinforced Smooth Flashing Application - Adhered Membrane Flashing (solvent-based adhesive): Apply the solvent-based bonding adhesive to both the underside of the membrane and the substrate at the minimum rate published by the manufacturer. Allow the bonding adhesive to dry until tacky to the touch before application of the flashing membrane.

- H. Flashing Application - Adhered Un-Reinforced Membrane Flashing: Apply un-reinforced membrane at field-fabricated penetrations or as reinforcement flashings in locations where preformed corners and pipe boots cannot be properly installed. Apply un-reinforced flashing in strict accordance with the published details and requirements of the roof membrane manufacturer. Allow the bonding adhesive to dry until tacky to the touch before application of the flashing membrane.
- I. Catalyzed Acrylic Resin Flashing System (at penetrations): Install the liquid-applied primer and flashing system in accordance with the membrane system manufacturer's printed installer's guidelines and other applicable written recommendations as provided by the manufacturer.
- J. Water Cut-Off: At end of day's work, or when precipitation is imminent, construct a water cut-off at all open edges. Construct cut-offs to withstand protracted periods of service without leaking using materials and methods compatible with the specified roof membrane system. Cut-offs must be completely removed prior to the resumption of roofing.

3.4 ROOF SYSTEM INTERFACE WITH RELATED COMPONENTS

- A. Roof Drains: Fit drains with clamping rings and strainer baskets. Provide a minimum 48-inch by 48-inch sump and a slope within the sump not exceeding 1/2:12. Extend the roof membrane over the drain opening and cut a hole in the membrane directly over the opening, leaving 1-inch of membrane extending past the drain flange into the drain opening. Punch holes through the roofing membrane at drain bolt locations. Set the membrane in a full bed (use full tube) of the specified water block sealant over the drain flange prior to securement of the clamping ring. Lap seams within the sump area must be avoided. Where lap seams cannot be located outside of the sump area, apply a separate target of the specified roof membrane to extend a minimum of 12-inches in all directions from the sump area and mechanically attached on 12-inch centers around the drain with the specified screws and plates. Heat weld the flashing target beyond the screws and plates, extending over the drain flange.
- B. Termination Bars: Prior to mechanical attachment of the specified termination bar with receiver, apply the specified water block sealant on the flashing substrate behind the membrane where the termination bar will be installed. Mechanically attach termination bars using the specified fasteners. Apply a continuous bead of the specified sealant at the top of termination bar sealant receiver lip.

3.5 FIELD QUALITY CONTROL AND INSPECTIONS

- A. Site Condition: Leave all areas around job site free of debris, roofing materials, equipment and related items after completion of job.
 - 1. Provide three (3) manufacturer's inspections, including Final.
- B. Notification of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion to schedule a final inspection date.
- C. Final Inspection
 - 1. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.
- C. Issuance of The Warranty: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

END OF SECTION 075416

SECTION 076200 - 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.

1.2 SUMMARY

- A. Section Includes:

- 1. Formed low-slope roof sheet metal fabrications.
- 2. Formed equipment support flashing.
- 3. Sheet metal flashing and trim

- B. Related Requirements:

- 1. Section 061000 "Rough Carpentry for Roofs" for wood nailers, curbs, and blocking.
- 2. Section 074113 "Standing Seam Metal Roofing."
- 3. Section 075416 "PVC Membrane Roofing."
- 4. Section 075200 "Modified Bituminous Membrane Roofing" for materials and installation of sheet metal flashing and trim integral with roofing.

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 PRE-INSTALLATION MEETINGS

- A. Pre-Installation Meeting: Conduct conference at Project site in conjunction with Roofing Pre-Installation Meeting.
 - 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
 - 3. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

- A. Materials List: Give written notification of the brand name and manufacturer of each material proposed for use and include a statement that all proposed materials meet the specification requirements. Obtain approval prior to placing orders.
 - 1. Submittal of catalog cut sheets, etc. in lieu of the materials list required above is not acceptable. Do not submit cut sheets unless specifically requested.
- B. Color Chart: Manufacturer's full range of colors for prefinished metals, including available gauges.
- C. Obtain approval of shop drawings, samples and certifications prior to fabrication and installation.
- D. Do not purchase, fabricate or install any sheet metal item until all required shop drawings and related submittals for each item are approved. Items purchased, fabricated and/or installed which are not in compliance with approved shop drawings are subject to immediate removal from the project at contractor's expense.
- E. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- F. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 6. Include details of termination points and assemblies.
 - 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 - 8. Include details of roof-penetration flashing.
 - 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 - 10. Include details of special conditions.
 - 11. Include details of connections to adjoining work.
 - 12. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches.
- G. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
- H. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12- inches long. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim: 12- inches long. Include fasteners and other exposed accessories.
3. Accessories: Full-size sample.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: 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, shop shall be listed as able to fabricate required details as tested and approved.

1.9 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 extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

- A. Special Warranty on Finishes: 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. 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: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 1. Design Pressure: As indicated on Drawings and as recommended by roof system manufacturer.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- E. Water Infiltration: Provide sheet metal flashings and trim that do not allow water infiltration into building interior.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 2605. 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. Color: As selected by Architect from manufacturer's full range.
 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5-mil.
- C. Metallic-Coated Steel Sheet: Provide aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; pre-painted by coil-coating process to comply with ASTM A 755/A 755M.
1. Surface: Smooth, flat.
 2. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 2605. 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.
 3. Color: As selected by Architect from manufacturer's full range.
 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.
- D. Stainless-Steel Sheet: ASTM A 240, Type 304, dead soft, fully annealed; with smooth, flat surface.
1. Finish: 2B (bright, cold rolled).
- E. Membrane Clad Metal: As required by roofing system manufacturer.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal 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.
 - 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. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- C. Solder:
 - 1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape ½- inch wide and 1/8- inch thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.
- I. 4 lb. lead sheet.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in 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 to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners 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 on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1- inch deep, filled with butyl sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal, but not less than one gage higher than metal being secured.
- F. Seams for Stainless Steel: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- G. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
- H. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than dimension indicated on Drawings. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
- B. Downspouts: Fabricate square downspouts to dimensions indicated, complete with mitered elbows, furnish wall brackets and accessories in same material as downspouts

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing (Gravel Stop): Fabricate in minimum 96-inch long, but not exceeding 12-foot- long sections. Furnish with 6-inch wide, joint cover plates. Shop fabricate interior and exterior corners.

- B. Copings: Fabricate in minimum 96-inch long, but not exceeding 12-foot-long sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal watertight. Shop fabricate interior and exterior corners.
 - 1. Coping Profile: As selected by Architect from Contractor's submittals. Refer to Fig 3-4A according to SMACNA's "Architectural Sheet Metal Manual" for general requirements.
 - 2. Seam Style: See details on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, 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.
 - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6- inches, staggered 24- inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.
- B. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 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, 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, levels, and slopes. 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. Secure cleats to substrate with fasteners specifically manufactured for the purpose at spacings of 6-inches on center. Provide ring shank fasteners or screws at wood substrates. Locate fasteners as close to hem of cleat as practical but no more than 2-inches from hem unless specifically indicated otherwise herein or on Drawings.
 4. Fabricate cleats to be a minimum of one gauge heavier than fascia metal.
 5. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 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: Do not place dissimilar metals in direct contact or in positions where water sheds across both metals. Where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10-feet with no joints within 24-inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4-inches for nails and not less than 3/4-inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Install metal to be water- and weathertight with lines and angles sharp and true and with plane surfaces free of waves or buckles. Hem all raw edges of exposed or finish sheet metal.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1-inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, 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.
 2. Prepare joints and apply sealants to comply with requirements in Section 079201 "Sealants for Roofing."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder aluminum sheet.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

- H. Rivets: Rivet joints in uncoated aluminum where necessary for strength.
- I. Follow recommendations of Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Architectural Sheet Metal Manual for fabricating in-shop and on-site, and for installation, unless otherwise specified herein or on Drawings.
- J. Follow published instructions of the product manufacturer for installation of extruded or proprietary metal products, unless otherwise specified herein or on Drawings.
- K. Use nails, screws, bolts, cleats or other fasteners of the same material or, if approved by Architect, of material chemically compatible with the contacted metal.
- L. Install shop-formed metal in 10- foot lengths maximum and with minimum number of pieces in each straight run.
- M. Miter and seal all inside and outside corners of gravel stop-fascia and coping cap. Shop fabricated corner pieces are preferable.
- N. Shop form all metal shapes, which are to be formed of prefinished metal, with protective plastic film in place. Do not remove plastic film until just prior to (or, if possible, after) installation.
- O. At all corners, shop form corner pieces of gravel stop, fascia and coping cap with 18 inch legs (joints no more than 18 inches from corner). Seal joint of corner piece.
- P. Form faces of gravel stop-fascia and coping cap with vertical faces of sufficient width to extend a minimum of 1-1/2-inches below wood blocking.

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Roof Drain Flashing: Use PMMA at 36 inches by 36 inches or at least large enough to extend a minimum of 12 inches outside drain flashing flange.
- C. Hanging Gutters: Install gutters as specified herein. Refer to the SMACNA Architectural Sheet Metal Manual.
1. Join sections with joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them into position. Provide end closures and seal watertight with sealant. Slope to downspouts.

2. Fasten gutter spacers to front and back of gutter.
 3. Anchor gutter with gutter brackets spaced not more than 36-inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
- D. Downspouts: Install new downspouts at existing locations. Refer to the SMACNA Architectural Sheet Metal Manual.
1. Join sections with 1-1/2-inch telescoping joints and pop rivet together.
 2. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60-inches o.c.
 3. Provide elbows at base of downspout to direct water away from wall.
 4. Place splash pans under downspouts.
- E. Splash Pans: Where downspouts terminate at lower roof areas, provide new splash pans or blocks over a walkpad. Size walkpad to be 6 inches longer and wider than splash pan. Adhere splash pan to walkpad using materials consistent with roof membrane installation.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Edge Metal: Install new gravel stop fascia as specified herein. Refer to the SMACNA Architectural Sheet Metal Manual.
1. Refer to sheet metal schedule for gauge and metal type.
 2. Fabricate gravel stop-fascia with flange width no wider than the width of the blocking less 1/2-inch and not less than 4-inches.
 3. Apply a strip of self-adhering membrane across the top of the blocking over roof membrane and extending down the outside face approximately the width of the vertical section of the gravel stop-fascia. Use strips as long as practical, lapping the ends 6-inches.
 4. Engage formed drip at lower edge of face with continuous cleat.
 5. Position back-up plate so that ends of sections are centered over it and fasten with at least two nails off the center.
 6. Leave a 1/4- inch opening between sections. Center the sections over the back-up plate.
 7. Nail through flange near center. Space nails 3-inches on center in a staggered pattern.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Install according to NC Building Code ES-1 requirements.
1. Install new coping cap as specified herein.
 2. Refer to sheet details for gauge and metal type.
 3. Prior to installation of coping cap, apply a strip of self-adhering membrane across the top of the blocking and extending down the outside and inside face approximately the width of the vertical sections of the coping cap. Use strips as long as practical, lapping the ends 6 inches.
 4. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 6-inch centers.

5. Anchor interior leg of coping with rubber gaskets and screw fasteners through slotted holes at 18-inches on center.
 6. Provide soldered joint, one- piece exterior corner pieces with 24” legs.
 7. Where terminating into a wall, provide turned- up tabs a min. of 4” behind a counterflashing piece.
 8. Do not use riveted connections.
 9. See drawing details for coping splice details.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
1. Install new counterflashings as specified herein.
 2. Refer to sheet metal schedule for gauge and metal type.
 3. Install new counterflashing at all roof- mounted equipment. Extend new counterflashing across top of curb beneath seating flange of unit. Extend flange down a minimum of 4 inches over base flashing. Secure counterflashing to top of curb, or to integral flange of unit with appropriate fasteners at 4-inches on center.
 4. Provide end caps at open ends of counterflashing. Do Not use sealant without prior approval of Roofing Consultant.
 5. Secure counterflashing to vertical surface with appropriate fasteners.
 6. Notch and solder receiver at corners.
 7. Notch and lap joints and inside corners. Notch and seam outside corners. Do not rivet or otherwise secure joints and corners.
 8. Lap ends of counterflashing 4 inches. Crimp hem of overlapping section around hem of underlapping section.

3.6 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.

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 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 sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in 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.

3.9 SHEET METAL SCHEDULE

- A. Gravel Stop-Fascia: 0.040 prefinished aluminum.
- B. Counterflashing: 24 gage metallic coated steel.
- C. Coping Caps: 0.050 prefinished aluminum.
- D. Hanging Gutters: 0.040 prefinished aluminum.
- E. Downspouts (for hanging gutters): 0.032 prefinished aluminum.
- F. Bonnet Flashings: 24 gage stainless steel.
- G. Hot Stack Flashings: 24 gage stainless steel.

END OF SECTION 076200

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SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Supply and installation of equipment, duct, pipe, and conduit supports.

B. Related Sections:

1. Section 061053 – Misc. Rough Carpentry for Roofs
2. Section 075200 – Modified Bituminous Membrane Roofing
3. Section 076200 – Sheet Metal Flashing and Trim

1.2 REFERENCES

A. Reference Standards: Latest edition as of Specification date.

1. ASTM International.
 - a. ASTM A 167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

1.3 SUBMITTALS

A. Product Data: Roof accessory manufacturer's literature, including material descriptions, dimensions of individual components and profiles, finishes, and installation details.

B. Maintenance information for roof accessories.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

B. Deliver accessories to Project site in original packages with seals unbroken, labeled with roof accessory manufacturer's name, product brand name and type, date of manufacture, and directions for storing.

C. Store accessories in original, undamaged containers in clean, dry, protected location on raised platforms with weather-protective coverings, within temperature range required by roofing system manufacturer. Protect UV-sensitive accessories from direct sunlight.

D. Do not store accessories at locations where new roofing materials have been installed.

E. Provide secure fencing/enclosures for all material storage and lay down areas.

F. Limit stored materials on structures to safe loading of structure at time materials are stored, and to avoid permanent deck deflection.

G. Handle accessories to avoid damage.

H. Conspicuously mark damaged accessories and remove from site as soon as possible.

1.5 PROJECT CONDITIONS

A. Verify existing dimensions and details prior to fabrication and installation of accessories. Notify Architect of conditions found to be different than those indicated in Contract Documents. Architect will review situation and inform Contractor and roof accessory manufacturer of changes.

B. Protect existing roofing from damage from construction activities. Repair damage to existing roofing from construction activities, which results in leakage.

- C. Environmental Limitations: Install roof accessories when existing and forecast weather conditions permit roof accessories to be installed according to roof accessory manufacturer's written instructions and warranty requirements.
 - 1. Do not proceed with installation during inclement weather except for temporary work necessary to protect building interior and installed materials. Remove temporary work and Work that becomes moisture damaged.

1.6 WARRANTIES

- A. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge. Written warranty signed by manufacturer including material and finish.

PART 2 – PRODUCTS

2.1 GENERAL

A. PIPE AND CONDUIT SUPPORTS:

Provide adjustable pipe supports at all conduits and piping.

B. ROOF HATCH:

- 2. Basis of Design: Bilco Type S, 36" x 30"
 - a. Material and Finish: Galvanized steel.
 - b. Provide a special coating finish as specified by the Designer of Record.
 - c. Roof hatch shall be pre-assembled by manufacturer.

C. PERFORMANCE CHARACTERISTICS:

- a. Cover shall be reinforced to support a minimum live load of 40 psf with a maximum deflection of 1/150th of the span and a 140 psf wind uplift for galvanized steel (Type S-20) and aluminum (Type S-50) roof hatches or 20 psf for stainless steel (Type S-90) roof hatches or roof hatches with an aluminum cover and galvanized steel curb (Type S-40).
- b. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
- c. Operation of the cover shall not be affected by temperature.
- d. Entire hatch shall be weather tight with fully welded corner joints on cover and curb.
- e. Galvanized steel (Type S-20) roof hatch shall be Miami-Dade Product approved (NOA No. 18-0226.04 Expiration Date: December 2, 2019), meeting large and small missile impact requirements. Florida Product Approval #FL15110.
- f. Cover: Shall be 14- gauge paint bond G-90 galvanized steel or 11- gauge with a 3" beaded flange with formed reinforcing members. Cover shall have a heavy extruded EPDM rubber gasket that is bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.

- g. Cover insulation: Shall be fiberglass of 1" thickness, fully covered and protected by a metal liner- 22-gauge paint bond G-90 galvanized steel.
 - h. Curb: Shall be 12" height and of 4-gauge paint bond G-90 galvanized steel. The curb shall be formed with a 3-1/2" flange with 7/16" holes provided for securing to the roof deck. The curb shall be equipped with an integral metal cap flashing of the same gauge and material as the curb, fully welded at the corners, including stamped tabs, 6" on center, to be bent inward to hold single- ply roofing membrane securely in place.
 - i. Curb insulation: Shall be rigid, high-density fiberboard of 1" thickness on outside of curb.
 - j. Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe through- bolted to the curb assembly.
 - k. Hardware:
 - 1) Heavy pintle hinges shall be provided.
 - 2) Cover shall be equipped with a spring latch with interior and exterior turn handles.
 - 3) Roof hatch shall be equipped with interior and exterior padlock hasps.
 - 4) The latch strike shall be a stamped component bolted to the curb assembly.
 - 5) Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1" diameter red vinyl grip handle to permit easy release for closing.
 - 6) Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be zinc plated and chromate sealed. Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.
 - 7) Finishes: Factory finish shall be: alkyd- based red oxide primed steel.
- C. Roof Hatch Accessories:
- 1. Ladder Safety Post: Manufacturer's standard ladder safety post. Post to lock in place on full extension. Provide release mechanism to return post to closed position.
 - a. Height: 42 inches above finished roof deck.
 - b. Material and Finish: Stainless steel, mill finished.
 - 2. Roof Hatch Rail System:
 - a. Furnish and install hatch rail system. The hatch rail system shall be field assembled and installed (by others) per the manufacturer's instructions.
 - b. Basis of Design: Babcock Davis, Mode; BSRCV36x30FG 36 x 30 Roof Hatch Railing
 - c. Performance characteristics:
 - 1) High visibility safety yellow color shall be molded in.
 - 2) Hatch rail system shall attach to the cap flashing of the roof hatch and shall not penetrate any roofing material.
 - 3) Hatch rail system shall satisfy the requirements of OSHA 29 CFR 1910.23 and shall meet OSHA strength requirements with a factor of safety of two.

- 4) Provide UV and corrosion resistant construction with a twenty-five-year warranty.
- 5) Self-closing gate shall be provided with hatch rail system.
- d. Posts and Rails: Shall be round pultruded reinforced fire-retardant yellow fiberglass treated with a UV inhibitor.
- e. Hardware: Mounting brackets shall be ¼” thick hot dip galvanized steel. Hinges and post guides shall be 6063T5 aluminum. Fasteners shall be Type 316 stainless steel.

2.2 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by roof accessory manufacturer for intended use and compatible with roof accessory.
- B. Fasteners: Non-magnetic, stainless steel metal recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide non-removable fastener heads to exterior, exposed fasteners. Install neoprene or EPDM washers at exposed fasteners.
- C. Drawbands: ASTM A 167, Type 304 or 316; adjustable, stainless-steel drawbands.
- D. Clamps: ASTM A 167, Type 304, stainless-steel clamps; or galvanized clamps; to secure pipes and conduits to wood blocking.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions with Installer and roof accessory manufacturer’s representative for compliance with requirements and for other conditions affecting performance of roofing accessories.
 1. Ensure that Work done by other trades is complete and ready to receive roof accessories, including:
 - a. Actual locations, dimensions, and other conditions affecting installation and performance of roof accessories.
 - b. Roof openings and penetrations are in place and set and braced.
 - c. Substrate is sound, dry, smooth, and clean, sloped for drainage, and securely anchored, and is ready to receive roof accessories.
 2. Notify Architect in writing of conditions which may adversely affect roof accessory installation or performance. Do not proceed with roof accessory installation until these conditions have been corrected and reviewed by Architect.
 3. Installation of roof accessories indicates acceptance of surfaces and conditions.

3.2 COORDINATION

- A. Coordinate layout and installation of roof accessories with installation of new roofing system and with adjacent construction to provide weathertight, secure, and non-corrosive installation, and to avoid or minimize adverse effects on completed new roofing.
 1. With Architect’s approval, adjust location of roof accessories that would interrupt roof drainage routes and roof expansion joints.

3.3 INSTALLATION

- A. General: Install roof accessories according to roof accessory manufacturer’s written instructions, to resist

exposure to weather without failing, rattling, leaking, and fastener disengagement.

1. Install level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
2. Fit to substrate and anchor securely in place. Use fasteners, separators, sealants, and other miscellaneous items as required.
3. 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 recommended by roof accessory manufacturer.
 - a. Coat concealed side of roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - b. Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install felt underlayment covered with slip sheet, or install polyethylene underlayment.
 - c. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturer for waterproof performance.
4. Seal joints in roof accessories with sealant recommended in writing by roof accessory manufacturer.
5. Flash into roofing system as recommended by roofing system manufacturer's written instructions.

B. Duct, pipe, and conduit supports:

1. Install supports 6 feet maximum on center unless noted otherwise.
2. Install special, wide supports at duct corners.

3.4 CLEANING AND PROTECTION

- A. Clean exposed surfaces according to roof accessory manufacturer's written instructions.
- B. Protect roof accessories from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roof accessories, inspect roof accessories for deterioration and damage, and describe nature and extent of deterioration and damage in written report, with copies to Architect and Owner's Representative.
- C. Repair or remove and replace roof accessories that do not comply with requirements, to condition free of damage and deterioration at time of Beneficial Occupancy.

END OF SECTION 077200

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SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:
1. Floors.
 2. Roofs.
 3. Walls and partitions.

1.2 PERFORMANCE REQUIREMENTS

- A. General: For the following constructions, provide through-penetration firestop 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 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.
 5. Smoke barriers.
- B. F-Rated Systems: Provide through-penetration firestop systems 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 through-penetration firestop systems 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 through-penetration firestop systems 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 through-penetration firestop systems 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.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of through-penetration firestop system product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
 - 2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer.
 - a. Engineer shall be legally qualified to practice in the state in which the project is located.

1.4 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 through-penetration firestop system products certifying that products furnished comply with requirements.
- C. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain through-penetration firestop systems from a single manufacturer.
- B. Installer's Qualifications: An experienced installer who is qualified by having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Firm shall hold current certification by third party attesting to its ability to select and install firestopping in accordance with performance requirements, have established management system for firestopping and employ trained supervisor (DRI) to maintain oversight of firestopping installation.
 - 1. Certification for firestopping firms: Firm shall be certified by one of the following:
 - a. Factory Mutual Global: FM Standard 4991.
 - b. UL Qualified Firestop Contractor.
 - 2. Qualification for Superintendent: Superintendent shall have a minimum of 3 years experience in firestopping.
 - 3. Qualification for Firestop Installer: Trained individual in accordance with requirements of certification of firm.
 - a. Firestop Installers Training (FIT) Level 1 by Specified Technologies, Inc.
 - b. Certified 3M Trained by 3M Fire Protection Products.
 - c. Hilti Basic Firestop Training
 - d. Similar training by manufacturers listed in Part 2.

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4. A manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:
1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system 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 1.
1. Before installation of fire-resistance-rated assemblies and penetrating items, review through-penetration firestop system and examine procedures for ensuring quality of installed systems. Require representatives of each entity directly concerned with through-penetration firestop system to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for through-penetration firestop system.
 - c. Through-penetration firestop system Manufacturer's service representative.
 - d. Through-penetration firestop system Installer.
 - e. Fire- resistance-rated masonry Installer.
 - f. Fire- resistance-rated gypsum board assembly Installer.
 - g. Mechanical piping Installer.
 - h. HVAC ductwork Installer.
 - i. Electrical wireway Installer.
 2. Review inspection and testing and inspecting agency procedures for field quality control, through-penetration firestop system installation, and coordination of penetrating item configurations with available rated through-penetration firestop system assemblies.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver through-penetration firestop system 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 through-penetration firestop 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 through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system 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.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hilti Construction Chemicals, Inc.
 - 2. Specified Technologies Inc.
 - 3. 3M Fire Protection Products.
 - 4. Tremco.

2.2 FIRESTOPPING, GENERAL

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

2.3 PENETRATION FIRESTOPPING

- A. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Fire-resistance-rated walls include fire walls, fire-barrier walls, and fire partitions.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- B. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Horizontal assemblies include floors, floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
 - 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 - 3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

- C. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.
- D. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.

2.4 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system 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 through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. 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 through-penetration firestop 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 through-penetration firestop systems 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 through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect through-penetration firestop systems in accordance with ASTM E 2174 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. Compliance Inspections: One week prior to inspections by authorities having jurisdiction, Manufacturer's Representative shall perform compliance inspection with General Contractor's designated representative present. Reports shall be provided to General Contractor, with a copy to the Owner, Architect, and Firestopping Installer.
- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.
- D. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.5 IDENTIFICATION

- A. Penetration Identification: Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system 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--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Through-penetration firestop system manufacturer's name.
 6. Installer's name.
- B. Wall Identification: Refer to Section 099123 "Interior Painting" for identification of fire-rated walls and smoke barriers.

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 through-penetration firestop 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 through-penetration firestop systems are without damage or deterioration at time of Final Acceptance. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

END OF SECTION 078413

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SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fire-resistive joint systems for the following:

1. Floor-to-floor joints.
2. Floor-to-wall joints.
3. Head-of-wall joints.
4. Wall-to-wall joints.
5. Joints in smoke barriers.

1.2 PERFORMANCE REQUIREMENTS

A. General: For joints in the following constructions, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of 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.

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. Smoke barriers.

B. Fire Resistance of Joint Systems: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equaling or exceeding fire-resistance rating of constructions in which joints are located, as determined by UL 2079.

1. Load-bearing capabilities as determined by evaluation during the time test.

C. Fire Resistance of Perimeter Fire-Containment Systems: Integrity and insulation ratings indicated as determined by UL 2079.

D. 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.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each fire-resistive joint system, show relationships to adjoining construction. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

C. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.
- B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.
- C. Qualification Data: For Installer.
- D. Research/Evaluation Reports: For each type of fire-resistive joint system.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Comply with requirements of Section 078413 "Penetration Firestopping."
- B. Source Limitations: Obtain fire-resistive joint systems for each kind of joint and construction condition indicated through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in "Performance Requirements" Article:
 1. Fire-resistive joint systems are identical to those tested per UL 2079. Perimeter fire-containment systems are identical to those tested per both UBC Standard 26-9 and UL 2079. Provide rated systems complying with the following requirements:
 - a. Fire-resistive joint systems correspond to those indicated by referencing system designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
- D. Preinstallation Conference: Refer to requirements of Section 078413 "Penetration Firestop Systems."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

- B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify Owner's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hilti Construction Chemicals, Inc.
 - 2. Specified Technologies Inc.
 - 3. 3M Fire Protection Products.
 - 4. Tremco.

2.2 FIRE-RESISTIVE JOINT SYSTEMS, GENERAL

- A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.
- B. Accessories: Provide components of fire-resistive joint systems, including forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

2.3 PERIMETER FIRE-CONTAINMENT SYSTEMS

- A. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:
 - 1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.
 - 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
- B. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079.
 - 1. L-Rating: Not exceeding 5.0 cfm/ft of joint at 0.30 inch wg at both ambient and elevated temperatures.

2.4 HEAD OF WALL SEALING

- A. Head of Wall Sealing: Comply with requirements of UL HW-D-0020 or equivalent design.
 - 1. Contractor's Option: Spray or sealant products may be used.
 - a. 3M; FireDam Spray or FD 150+ Sealant
 - b. GCP Applied Technologies; FlameSafe 3000 Spray or FS 900 Sealant
 - c. Hilti; CP672 Firestop Spray or CP 606 Sealant

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.
- B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing 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 fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify fire-resistive joint systems with preprinted metal or plastic labels or self-adhesive vinyl labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint 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 - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect fire-resistive joint systems according to ASTM E 2393 and to prepare inspection reports.
 1. Inspecting agency will state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.
- B. Compliance Inspections: One week prior to inspections by authorities having jurisdiction, Manufacturer's Representative shall perform compliance inspection with General Contractor's designated representative present. Reports shall be provided to General Contractor, with a copy to the Owner, Architect, and Firestopping Installer.
- C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and inspecting agency has approved installed fire-resistive joint systems.
- D. If deficiencies are found, repair or replace fire-resistive joint systems so they comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Final Acceptance. 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

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SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes joint sealants for the following applications, including those specified by reference to this Section:
 - 1. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 2. Exterior joints in horizontal traffic surfaces.
 - 3. Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 4. Interior joints in horizontal traffic surfaces.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.
- D. Compatibility and adhesion test reports.
- E. Product certificates.

1.4 QUALITY ASSURANCE

- A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
- B. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
 - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

1.5 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion for exterior elastomeric sealants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 Articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range of available colors including premium colors.

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- D. Single Component Nonsag Neutral-Curing Silicone Sealant ES-1: Not Used.
- E. Single-Component Neutral-Curing Silicone Sealant ES-2:
 - 1. Products:
 - a. Dow Corning Corporation; 790.
 - b. Pecora Corporation; 864.
 - c. Tremco; Spectrem 2.
 - 2. Type and Grade: S (single component) and NS (nonsag).
 - 3. Class: 50.
 - 4. Use Related to Exposure: NT (nontraffic).
 - 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - 6. Custom color to match adjacent substrates.

- F. Single-Component Traffic Exposure Neutral-Curing Silicone Sealant ES-3:
1. Products:
 - a. Dow Corning Corporation; 890-SL
 - b. Pecora Corporation; 300 SL
 - c. Sika Corporation; 728 SL
 - d. Tremco Incorporated; Spectrem 900 SL
 2. Type and Grade: S (single component) and P (pourable).
 3. Class: 100/50.
 4. Uses Related to Exposure: NT and T (traffic).
 5. Uses Related to Joint Substrates: M A and O, as applicable to joint substrates indicated.
- G. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant ES-4:
1. Products:
 - a. Dow Corning Corporation; 999.
 - b. Pecora Corporation; 898.
 - c. Sika Corporation; SikaSil N Plus.
 - d. Tremco; Tremsil 600 White.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 25.
 4. Use Related to Exposure: NT (nontraffic).
 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
- H. Single-Component Nonsag Urethane Sealant ES-5: Not Used
- I. Multicomponent Pourable Urethane Sealant ES-6:
1. Products:
 - a. Pecora Corporation; Urexpan NR-200.
 - b. Tremco; THC-901.
 - c. Tremco; THC-900 - ramps
 - d. Tremco; Vulkem 445SSL.
 - e. Pecora Corporation; DynaTred.
 - f. Pecora Corporation; DynaTrol II-SG.
 - g. Sika Corporation, Inc.; Sikaflex - 2c SL
 2. Type and Grade: M (multicomponent) and P (pourable).
 3. Class: 25.
 4. Use Related to Exposure: T (traffic).
 5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Ceramic tile.

2.4 EPOXY RESIN JOINT SEALANTS

- A. Epoxy Resin Sealant ERS-1: Comply with ASTM C 881, Type III, Grade 3, Class B and C.
- B. Products: Pick-Proof two-component, solvent-free, moisture insensitive, low modulus, non-sagging epoxy resin gel.
1. Sika Corporation; MasterEmaco ADH326.
 2. Sika Corporation; Sikadur 23, Lo-Mod Gel

2.5 LATEX JOINT SEALANTS

- A. Latex Sealant LS-1: Comply with ASTM C 834, Type P, Grade NF.

B. Products:

1. GE; Momentive Performance Materials; RCS20.
2. Pecora Corporation; AC-20+.
3. Sika; Sikacryl 20FC.
4. Tremco Incorporated; Tremflex 834.

2.6 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints AS-1: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products:

- a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
- b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

- B. Acoustical Sealant for Concealed Joints AS-2: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

1. Products:

- a. Pecora Corporation; BA-98.
- b. Tremco; Tremco Acoustical Sealant.

2.7 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), or B (bicellular material with a surface skin), as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance. Consult the sealant manufacturer to confirm the specific backer material to be used for the specific project and application, and submit to Architect the manufacturer's written recommendations.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
 - a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
 - 2. Remove laitance and form-release agents from concrete.
 - a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 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 type recommended by manufacturer to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- G. Installation of Preformed Silicone-Sealant System: Comply with manufacturer's written instructions.
- H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- I. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 EXTERIOR JOINT-SEALANT SCHEDULE

- A. Cast-in-place concrete, vertical construction joints:
1. ES-2 Single-component neutral-curing silicone sealant.
- B. Cast-in-place concrete slabs, horizontal nontraffic and traffic isolation and contraction joints:
1. ES-3 Single-component pourable neutral-curing silicone sealant.
- C. Unit masonry, vertical control and expansion joints:
1. ES-2 Single-component neutral-curing silicone sealant.
- D. Exterior vertical joints between different materials listed above:
1. ES-2 Single-component neutral-curing silicone sealant.
- E. Exterior perimeter joints between materials listed above and frames of doors windows and louvers.
1. ES-2 Single-component neutral-curing silicone sealant.
- F. Exterior control and expansion joints in ceilings and other overhead surfaces.
1. ES-2 Single-component neutral-curing silicone sealant.
- G. Exterior control and expansion joints in horizontal traffic surfaces of unit pavers:
1. ES-3 Single-component pourable neutral-curing silicone sealant.
- H. Other vertical or horizontal non-traffic joints:
1. ES-2 Single-component neutral-curing silicone sealant.
- I. Other exterior horizontal traffic joints:
1. ES-3 Single-component pourable neutral-curing silicone sealant.

3.4 INTERIOR JOINT SEALANT SCHEDULE

- A. Vertical control and expansion joints on exposed interior surfaces of exterior walls.
 - 1. ES-2 Single-component neutral-curing silicone sealant.
- B. Vertical joints on exposed surfaces of interior unit masonry walls and partitions:
 - 1. ERS-1: Epoxy resin gel sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- C. Interior perimeter joints of exterior openings.
 - 1. ES-2 Single-component neutral-curing silicone sealant.
- D. Interior ceramic expansion, control, contraction, and isolation joints in horizontal traffic surfaces.
 - 1. ES-6 Multi-component pourable polyurethane sealant.
- E. Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
 - 1. ES-4 Single-component mildew-resistant neutral -curing silicone sealant.
- F. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
 - 1. LS-1 Latex sealant.
 - 2. Joint-Sealant Color: Paintable white.
- G. Other non-dynamic interior joints including between interior wall surfaces and casework.
 - 1. LS-1 Latex sealant.
 - 2. Joint-Sealant Color: Clear.
- H. Acoustical interior joints for exposed joints.
 - 1. AS-1 Latex sealant.
- I. Acoustical interior joints for concealed joints.
 - 1. AS-2 Latex sealant.

END OF SECTION 079200

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SECTION 079201 - SEALANTS FOR ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes product and execution requirements related to the installation of sealants associated with sheet metal flashing work, and sealants at high-temperature penetrations.

1.2 RELATED SECTIONS

- A. Related Documents: The Contract Documents, as defined in Section 011000 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

1.3 REFERENCES

- A. Reference standards of the following sources are applicable to products and procedures specified in Part 2 - Products and Part 3 – Execution of this Section:
 - 1. American Society for Testing and Materials (ASTM)
 - a. ASTM C 920 – Standard Specification for Elastomeric Joint Sealants
 - b. ASTM C 661 - Standard Test Method for Indentation Hardness of Elastomeric Type Sealants by Means of a Durometer
 - c. ASTM C 679 - Standard Test Method for Tack-Free Time of Elastomeric Sealants
 - d. ASTM C 719 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)
 - e. ASTM C 794 - Standard Test Method for Tack-Free Time of Elastomeric Sealants
 - f. ASTM C 1135 - Standard Test Method for Determining Tensile Adhesion Properties of Structural Sealants
 - g. ASTM C 1193 - Standard Guide for Use of Joint Sealants
 - h. ASTM C 1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants

1.4 SUBMITTALS

- A. Prior to the start of work, submit the following to the Owner for approval:
 - 1. Product submittals required within Section 013300. Include a color selection chart and product data for each type of sealant from the manufacturer's full range of colors.

1.5 QUALITY ASSURANCE PROCEDURES

- A. Applicator 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 a manufacturer's warranty. Company shall have a minimum of 5 years documented experience certified by roofing system manufacturer.
- B. Single Source Responsibility: Roofing system materials and components shall be supplied and warranted by roofing system manufacturer for specified roofing system and shall follow specified regulatory requirements.
- C. Examine the project manual and drawings. Verify all dimensions, detail conditions, roof plan notes and existing site conditions that may affect the work. Verification of existing dimensions and site conditions

is the responsibility of the Contractor. No additional compensation will be considered for failure to verify existing dimensions, detail conditions, roof plan note callouts, and existing site conditions.

- D. Upon examination, if conflicts between the technical specifications and drawings, and those of federal, state or local regulatory agencies, the product manufacturer, industry roofing standards, or Owner-mandated requirements are discovered, notify the Owner immediately for resolution.
- E. During work, if conditions are discovered which do not allow for continuation of the work per the technical specifications and drawings, notify the Owner immediately for resolution.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry, undamaged, seals and labels intact.
- B. Store materials in weather protected environment, clear of ground and moisture. Cover insulation, roofing materials, and other moisture-sensitive products with a canvas tarp.
- C. Protect adjacent materials and surfaces against damage from roofing work. Do not store materials on previously completed roofing.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not perform work during inclement weather. Refer to product manufacturer for outdoor temperature requirements for installation of materials. Do not install materials at times when the outdoor temperature does not fall within the minimum/maximum temperature requirements of the manufacturer.
- B. Cold weather precautions:
 - 1. Store products that may be negatively affected by exposure to cold weather, such as primers, adhesives, sealants and cements, in a heated location. Refer to the sealant manufacturer and NRCA requirements and recommendations for additional cold weather application recommendations and restrictions.
- C. Material Safety Data Sheets (MSDS) of all specified products shall remain on site for the duration of this project.

PART 2 – PRODUCTS

2.1 GENERAL

- A. **Compatibility:** Provide joint sealants, backings, and other related materials that are compatible with one another, joint substrates under conditions of service and application, and any adjacent or previous sealants, as demonstrated by the sealant manufacturer.
- B. Color of exposed exterior sealants used in conjunction with sheet metal flashings shall match adjacent sheet metal, unless otherwise indicated by the Designer of Record. Color of all other sealants shall be selected by the Designer of Record from the manufacturer's full range of colors.

2.2 SEALANT

- A. Sealant: Moisture-cured, non-sag, urethane sealant, in compliance with ASTM C 920, Type S, Class 35, Grade NS. Color to match sheet metal or as directed by Owner.
 - 1. Closed- cell backing materials, bond breakers, and primers as recommended by the sealant manufacturer for the joint conditions encountered.
 - 2. Sealant (Urethane):
 - a. Masterseal NP 1 by Sika.
 - b. Sikaflex 1a by Sika
 - c. Dymonic 100 by Tremco

Note: Color of sealant to be selected by Designer of Record from the manufacturer’s full range of colors. All sealants shall be one-part.

2.3 ACCESSORIES

Item	Acceptable Product / Standard
Bond Breaker Tape	Polyethylene or other plastic tape as recommended by the sealant manufacturer; non-bonding to sealant; self-adhesive where applicable.
Backer Rod	Closed-cell polyethylene of not less than 10 psi compression deflection (25 percent) as recommended by sealant manufacturer.
Neoprene Compressible Filler	Double sided adhesive, water resistant, ASTM D 1056, Class SC (oil resistant and medium swell), 2 to 5 psi compression deflection.
Neoprene Pad	¼” thick minimum water-resistant neoprene pad.
Primer / Cleaner	Non-staining, as recommended by sealant manufacturer for each substrate.

PART 3 - EXECUTION

3.1 SEALANT INSTALLATION

- A. Sealant installation related to sheet metal flashings:
 - 1. Surface preparation: Prior to installation, prepare surfaces specified to receive sealant as recommended by the sealant manufacturer. Clean surfaces immediately before installation of sealants to provide surfaces suitable for the installation of sealant, removing all foreign material, dust, oil, grease, water, surface dirt, and existing paint. Clean metal surfaces using a solvent that leaves no residue, such as toluene or xylene. Use clean clothes or lint-free paper towels for cleaning with solvents and drying.
 - 2. Priming: If required or recommended by the sealant manufacturer, apply primer in accordance with the sealant manufacturer’s written instructions. Apply primer with a clean, dry, lint-free

- cloth. Do not dilute materials. Flooding of the substrate surface is not permitted. Continue primer to areas of sealant bond only.
3. Sealant installation: Install sealant where shown on the project drawings in accordance with the requirements and recommendations of the sealant manufacturer.
 - a. Use sealant-dispensing equipment to push sealant bead into opening. Fill joint opening to full and proper configuration. Apply in continuous operation.
 - b. Before skinning or curing begins, tool sealant with metal spatula. Provide concave, smooth, uniform, sealant finish. Eliminate air pockets and ensure complete contact on both sides of joint opening. Tool joints in one continuous stroke. The use of soaps, oils, water and or alcohols as tooling aids are not permitted.

END OF SECTION 079201

SECTION 079500 - EXPANSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
1. Architectural joint systems for building interiors.
 2. Architectural joint systems for building exteriors.

1.2 DEFINITIONS

- A. Maximum Joint Width: Widest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.
- B. Minimum Joint Width: Narrowest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.
- C. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage (plus or minus) of nominal value of joint width.
- D. Nominal Joint Width: The width of the linear opening specified in practice and in which the joint system is installed.

1.3 SUBMITTALS

- A. Shop Drawings: Provide the following for each joint system specified:
1. Placement Drawings: Include line diagrams showing plans, elevations, sections, details, splices, blockout requirement, entire route of each joint system, and attachments to other work. Where joint systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
 2. Architectural Joint System Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
 - a. Manufacturer and model number for each joint system.
 - b. Joint system location cross-referenced to Drawings.
 - c. Nominal joint width.
 - d. Movement capability.
 - e. Classification as thermal or seismic.
 - f. Materials, colors, and finishes.
 - g. Product options.
 - h. Fire-resistance ratings.
- B. Samples for Initial Selection: For each type of joint system indicated.
1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.
- C. Samples for Verification: For each type of architectural joint system indicated.
1. Full width by 6 inches long, for each system required.

- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for current products.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain interior architectural joint systems through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of architectural joint systems and are based on the specific systems indicated. Refer to Section 016000 "Product Requirements."
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Accessibility Requirements: Comply with applicable provisions in ICC A117.1.
- E. Fire-Test-Response Characteristics: Where indicated, provide architectural joint system and fire-barrier assemblies identical to those of assemblies tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Hose Stream Test: Wall-to-wall and wall-to-ceiling assemblies shall be subjected to hose stream testing.

1.5 COORDINATION

- A. Coordinate installation of exterior wall and soffit joint systems with roof expansion assemblies to ensure that wall transitions are watertight. Roof expansion assemblies are specified in Division 07.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Products: The design for each architectural joint system specified in Part 3 "Expansion Joint Cover Schedule" is based on the products named. Subject to compliance with requirements, provide either the named products or comparable products by one of the following:
 - 1. Balco / Metalines. (Basis-of-Design).
 - 2. Conspec Systems, Inc.
 - 3. MM Systems Corp.
 - 4. Pawling Corp.
 - 5. Watson Bowman Acme.
- B. Preformed Joint Sealants:
 - 1. EMSEAL Joint Systems, Ltd. (Basis-of-Design).
 - 2. Comparable product approved by Architect.

2.2 MATERIALS

- A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, 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.
 2. Mill Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
 3. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
- B. Elastomeric Seals: Preformed elastomeric membranes or extrusions to be installed in metal frames.
- C. Compression Seals: ASTM E 1612; preformed rectangular elastomeric extrusions having internal baffle system and designed to function under compression.
- D. Strip Seals: ASTM E 1783; preformed elastomeric membrane or tubular extrusions having an internal baffle system and secured in or over a joint by a metal locking rail.
- E. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.
- F. 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 meet performance criteria for required rating period.
- G. Moisture Barrier: Flexible elastomeric material, Santoprene.
- H. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.3 ARCHITECTURAL JOINT SYSTEMS, GENERAL

- A. General: Provide architectural joint systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where joint changes direction or abuts other materials.
 2. Include factory-fabricated closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.
- B. Design architectural joint systems for the following size and movement characteristics:
1. Nominal Joint Width: As indicated on Drawings.
 2. Movement Capability: As indicated on Drawings.
 3. Type of Movement: Thermal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and blockouts where architectural joint systems will be installed for installation tolerances and other conditions affecting performance of work.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to architectural joint system manufacturer's written instructions.

- B. Repair concrete slabs and blockouts using manufacturer's recommended repair grout of compressive strength adequate for anticipated structural loadings.
- C. Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.
- D. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing architectural joint assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install joint systems.
 - 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 - 2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper joint installation and performance.
 - 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
 - 4. Locate in continuous contact with adjacent surfaces.
 - 5. Heavy-Duty Systems: Repair or grout blockout as required for continuous frame support and to bring frame to proper level. Shimming is not allowed.
 - 6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
- C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
 - 1. Provide in continuous lengths for straight sections.
 - 2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
 - 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer to both sides of slabs before installing compression seals.
- E. Foam Seals: Install with adhesive recommended by manufacturer.
- F. Epoxy-Bonded Seals: Pressurize seal for time period and to pressure recommended by manufacturer. Do not overpressurize.
- G. Terminate exposed ends of joint assemblies with field- or factory-fabricated termination devices.
- H. Fire-Resistance-Rated Assemblies: Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.
 - 1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.
- I. Water Barrier: Provide water barrier at exterior joints and where called for on Drawings. Provide drainage fittings at a maximum of 50 feet or where indicated.

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 joints. Reinstall cover plates or seals prior to Substantial Completion of the Work.

3.5 EXPANSION JOINT COVER SCHEDULE

- A. Interior Wall-to-Wall and Ceiling-to-Ceiling Joint Cover (AJS-1): BALCO 6GW 6000 Wall & Ceiling
- B. Exterior Wall-to-Wall Joint Material (AJS-2): BALCO FCW Exterior Flat Silicone – FCWW-2-SIL Wall to Wall. Custom color as selected by Architect
- C. Interior Floor-to-Floor Joint Cover (AJS-3): BALCO NBAF Alum No Bump 1-2g Floor to Floor

END OF SECTION 079500

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SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Standard hollow metal doors and frames.

1.2 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.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.
 - 1. Show fenestration nameplate data indicating u-factor, solar heat gain and air infiltration (leakage).
- 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.
- C. Door and Frame Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

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. Rating and Labeling of Fenestration Products: Provide permanent nameplate, complying with ASHRAE 90.1, Chapter 5, installed by manufacturer, listing the following characteristics as determined by an independent laboratory acceptable to the Authority Having Jurisdiction:
 - 1. U-factor.
 - 2. Solar Heat Gain Coefficient.
 - 3. Air Infiltration (Leakage).
- 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. MPI Custom Steel Doors and Frames.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A60 (galvannealed) 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 Section 088000 "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. Thickness: 1-3/4 inches.
 - 3. 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 4.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
 - 1) Locations: Exterior doors.
 - 4. Vertical Edges for Single-Acting Doors: Beveled edge.
 - a. Beveled Edge: 1/8 inch in 2 inches.
 - 5. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
 - 6. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.

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7. 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 2 (Seamless), unless noted otherwise.
 2. Material Thickness: 16 gauge.
- 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 2 (Seamless), typical, unless noted otherwise.
 2. Material Thickness: 16 gauge.
 3. Provide A60 galvanized coating at wet locations.
- 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.
 3. Frames for Level 3 Steel Doors: 14 gauge steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet unless otherwise indicated.
1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as full profile welded unless otherwise indicated.
 3. Frames for Level 3 Steel Doors: 16 gauge steel sheet.
 4. Frames for Wood Doors: 16 gauge steel sheet.
 5. Frames for Borrowed Lights: 14 gauge steel sheet.
 6. Provide A60 galvanized coating at wet locations.
- 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.

- 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.

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. 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.
 3. 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.
- D. 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) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) 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) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) 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.
 7. Door Silencers: Except on weather-stripped doors, 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.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. 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 Section 087100 "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.
- G. 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. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. 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. 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.
 6. 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 Section 088000 "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 081113

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SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 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.

1.2 ACTION 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 Initial Selection: For factory-finished doors.
- D. Samples for Verification: Factory finishes applied to actual door face materials, approximately 12 by 12 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors from single manufacturer.
- B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.
- D. 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 43 and 70 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. VT Industries (Basis-of-Design).
 - 2. Masonite Architectural Doors.
 - 3. Oshkosh Door Company

2.2 DOOR CONSTRUCTION, GENERAL

- A. Particleboard-Core Doors:
 - 1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no added 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 structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

- B. 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.
- C. Mineral-Core Doors:
1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:
 - a. 5-inch top-rail blocking.
 - b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
 - c. 5-inch midrail blocking, in doors indicated to have armor plates.
 - d. 5-inch midrail blocking, in doors indicated to have exit devices.
 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
1. Grade: Custom (Grade A faces).
 2. Species: Select White Birch.
 3. Cut: Plain sliced.
 4. Match between Veneer Leaves: Book match or slip match as instructed by Architect.
 5. Assembly of Veneer Leaves on Door Faces: Running match.
 6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 7. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.
 8. Exposed Vertical Edges: Same species as faces.
 9. Core: Particleboard, unless otherwise indicated.
 10. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.

2.4 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.
1. Wood Species: Species compatible with door faces.
 2. Profile: Manufacturer's standard shape.
 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.
 - 2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. 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 Section 088000 "Glazing."

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. 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. Finish top of doors in multi-story spaces. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises, unless noted otherwise.
- C. Finish doors at factory.
- D. Transparent Finish:
 - 1. Grade: Custom.
 - 2. Finish: AWI catalyzed polyurethane system.
 - 3. Stain, Effect and Sheen: As selected by Architect from manufacturer's full range.

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 Section 087100 "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. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

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 081416

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SECTION 082130 - FIBERGLASS REINFORCED POLYESTER (FRP) DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fiberglass reinforced polyester doors with aluminum frames.

1.2 ACTION SUBMITTALS

- A. Product Data: Submit door manufacturer's product data, specifications, and installation instructions for each type of door and frame.
 - 1. Include details of core and edge construction and similar components.
- B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, requirements for factory finishing, and other pertinent data.
- C. Samples: Two sets of manufacturer's full color selections.

1.3 COORDINATION

- A. Door Undercuts: Coordinate door undercut with specified threshold to meet accessibility requirements and provide positive seal to the threshold weatherstrip.

1.4 WARRANTY

- A. Warranty: Warrant doors and frames against failure in materials and workmanship, including excessive deflection, faulty operation, and deterioration of finish or construction in excess of normal weathering.
 - 1. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer: Subject to compliance with requirements, provide doors and frames by one of the following:
 - 1. Chem-Pruf Fiberglass Door Company.
 - 2. Cline Doors.
 - 3. Edgewater FRP Door.
 - 4. Special-Lite.
 - 5. Tiger Door.

2.2 DOOR MATERIALS AND COMPONENTS

- A. Door Construction:
 - 1. Thickness: 1-3/4-inch.
 - 2. Stiles and Rails:
 - a. Aluminum extrusions made from 6063 aluminum alloys with a minimum temper of T5.

- b. Minimum 2-5/16-inch deep one-piece extrusion with have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.
 - c. Top rails must have integral legs for interlocking continuous extruded aluminum flush cap.
 - d. Bottom rails must have integral legs for interlocking continuous weather bar with single nylon brush weather stripping or manually adjustable door bottom with two nylon brush weather stripping.
 - e. Meeting stiles to include integral pocket to accept pile brush weather seal.
 - f. Extruded stiles and rails to have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place.
3. Corners: Mitered.
 - a. Secured with 3/8-inch diameter full-width steel tie rod through extruded splines top and bottom which are integral to standard tubular shaped rails.
 - b. 1-1/4 by 1-1/4 by 3/16-inch 6061 aluminum angle reinforcement at corners.
 4. Core: Foamed-in-place closed-cell polyurethane foam with a minimum of 5 pounds per cu.ft. density. The door assembly shall have a minimum "R" value of 11.
 5. Face Sheet: 0.120-inch minimum thickness fiberglass reinforced polyester (FRP) with a sandstone-textured finish.
 - a. Color: As selected by Architect from manufacturer's full range.
 6. Cutouts: Manufacture doors with cutouts for required vision lites, louvers, and panels.
 7. Hardware: Refer to Section 087100 "Door Hardware" for hardware requirements.
 - a. Pre-machine doors in accordance with templates from specified hardware manufacturers.
 - b. Factory install door hardware.
 8. Reinforcements.
 - a. Aluminum extrusions made from 6061 or 6063 aluminum alloys.
 - b. Sheet and plate to conform to ASTM-B209.
 - c. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.
- B. Glazing: Glazing shall be factory installed. Comply with applicable requirements in Section 088000 "Glazing."
- C. Louvers: Manufacturer's standard, factory supplied and installed.

2.3 ALUMINUM DOOR FRAMING SYSTEMS

- A. Tubular Framing: Factory fabricated.
1. Size and Type: As indicated on the Drawings.
 2. Materials: Aluminum extrusions, 6063-T5 alloy, 1/8-inch minimum wall thickness.
 3. Applied Door Stops: 0.625-inch high, with screws and weatherstripping. Door stop shall incorporate pressure gasketing for weathering seal. Counterpunch fastener holes in door stop to preserve full metal thickness under fastener head.
 4. Frame Members: Box type with 4 enclosed sides.
 5. Caulking: Caulk joints before assembling frame members.
 6. Joints:
 - a. Secure joints with fasteners.
 - b. Provide hairline butt joint appearance.

7. Applied Stops: For side, transom, and borrowed lites and panels. Applied stops shall incorporate pressure gasketing for weathering seal. Reinforce with solid bar stock fill for frame hardware attachments.
8. Hardware: Premachine and reinforce frame members for hardware in accordance with manufacturer's standards and hardware schedule.
9. Anchors:
 - a. Anchors appropriate for wall conditions to anchor framing to wall materials.
 - b. Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.
 - c. Secure head and sill members of transom, side lites, and similar conditions.
10. Finish: Clear anodized finish.

2.4 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Inspection: Installer shall examine aluminum door frames and verify that frames are correct for proper hanging of corresponding doors. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 DOOR INSTALLATION

- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors plumb, level, square, true to line, and without warp or rack.
- C. Anchor frames securely in place.
- D. Separate aluminum from other metal surfaces with bituminous coatings.
- E. Install exterior doors to be weathertight in closed position.

END OF SECTION 082130

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SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, materials, individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
- C. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of 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.

1.4 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Steel Sheet: Uncoated or cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. 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.

- D. 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. Surface Preparation for Metallic-Coated Steel Sheet: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - a. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
 3. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Acudor Products, Inc.
 2. J. L. Industries, Inc.
 3. Karp Associates, Inc.
 4. Larsen's Manufacturing Company.
 5. MIFAB, Inc.
 6. Milcor Inc.
 7. Nystrom, Inc.
 8. Williams Bros. Corporation of America (The).
- B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
1. Locations: Wall and ceiling surfaces.
 2. Door: Minimum 0.060-inch- thick sheet metal, set flush with exposed face flange of frame.
 3. Frame: Minimum 0.060-inch- thick sheet metal with 1-inch- wide, surface-mounted trim.
 4. Provide metallic coated steel sheet for high humidity applications.
 5. Hinges: Continuous piano.
 6. Latch: Cam latch operated by screwdriver with interior release.

2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
 2. Provide mounting holes in frames for attachment of units to metal framing.
 3. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

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 083113

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SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior and interior storefront framing.
2. Exterior and interior manual-swing entrance doors.

B. Products installed, but not furnished, under this Section include the following:

1. Door hardware furnished under Section 087100 "Door Hardware."

1.2 PREINSTALLATION CONFERENCE

A. Conduct conference at Project site to comply with requirements in Section 013100 - Project Management and Coordination. Review and discuss methods and procedures related to aluminum-framed entrances and storefront including the following:

1. Finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to perform Work and avoid delays.
2. Coordination of finishes of aluminum storefront and entrances with other aluminum framing systems that match color and finish.
3. Coordinate interrelationship of aluminum storefront with other exterior wall components. Include provisions for structural anchorage, glazing, flashing, weeping, sealants, and protection of finishes.
4. Sequence of Work required to construct a watertight and weathertight exterior building envelope.
5. Inspect and discuss condition of substrate and other preparatory Work performed by other trades.

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.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other Work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in system to exterior.
2. Show sill pan/sill subframe/sill receptor.
3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1. Sill Pan/Sill Subframe/Sill Receptor: 12 inch length.

D. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch 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.
- E. Entrance Door Hardware Schedule: Coordinate and comply with requirements specified in Section 087100 - Door Hardware.
 - F. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 1. Detail fabrication and assembly of aluminum-framed systems.
 2. Detail anchorage system to substrate.
 3. Include design calculations.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer.
 - B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
 - C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.
 - D. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C1401. Include periodic quality-control reports.
 - E. Sample Warranties: For special warranties.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.
- 1.6 QUALITY ASSURANCE
- A. Manufacturer's Qualifications: Provide entrances and storefront produced by a single manufacturer with not less than 10 years successful experience in the fabrication of assemblies of the type and quality required.
 - B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
 1. Installer shall have successfully completed not less than two projects of similar size, scope, and complexity as that of this Project within the last three years.
 - C. Testing Agency Qualifications: Qualified per ASTM E699 for testing indicated.
 - D. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
 - E. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one

another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

1.7 MOCKUPS

A. 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 wall area as shown on Drawings.
2. Testing shall be performed on mockups according to 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 mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 COORDINATION

A. Coordinate doors, frames, door hardware, and other work for proper installation of door hardware, furnished under other Sections and installed in aluminum-framed entrance and storefront systems. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include the following:
 - a. Structural failures including excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals 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: Manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes the following:
 - a. Color fading more than 5 Hunter units when tested per ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested per 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 PERFORMANCE CRITERIA

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 - 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 story drift, twist, column shortening, long-term creep, and deflection, from uniformly distributed and concentrated live loads.
 2. Dimensional tolerances of building frame and other adjacent construction.
 3. Failure also includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Glass breakage.
 - e. Noise or vibration created by wind and thermal and structural movements.
 - f. Loosening or weakening of fasteners, attachments, and other components.
 - g. Sealant failure.
 - h. Failure of operating units.
- C. Structural Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed $L/175$ of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to $3/4$ inch, whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to 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 directly below them to less than $1/8$ inch and clearance between members and operable units directly below them to less than $1/16$ inch.
- E. Structural: Test according to ASTM E330 as follows:
 1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.
- F. Air Infiltration: Test per NFRC 400 or ASTM E283 for infiltration as follows:
 1. Fixed Framing and Glass Area: Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.75 lbf/sq. ft.
 2. Entrance Doors:

- a. Pair of Doors: Maximum air leakage 1.0 cfm/sq. ft. when tested at a static-air-pressure differential of 1.57 lbf/sq. ft.
 - b. Single Doors: Maximum air leakage 0.5 cfm/sq. ft. when tested at a static-air-pressure differential of 1.57 lbf/sq. ft.
- G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- H. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
1. Maximum Water Leakage: No uncontrolled water penetrating aluminum-framed systems or water appearing on systems' 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 and water that cannot damage adjacent materials or finishes.
- I. Interstory Drift: Accommodate design displacement of adjacent stories indicated.
1. Design Displacement: As indicated on Drawings.
 2. Test Performance: Comply with criteria for passing, based on building occupancy type, when tested per AAMA 501.4 at design displacement and 1.5 times design displacement.
- J. Energy Performance: Certify and label energy performance per NFRC as follows:
1. Thermal Transmittance (U-factor): The following components shall provide U-factors of not more than indicate as determined per NFRC 100.
 - a. Fixed Glazing and Framing Areas: 0.45 Btu/sq. ft. x h x deg F.
 - b. Entrance Doors: 0.77 Btu/sq. ft. x h x deg F.
 2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.25 as determined per NFRC 200
 3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 68 as determined per NFRC 500.
- K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperatures.
1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

2.2 MANUFACTURERS

- A. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or comparable product by one of the following:
1. Kawneer North America (Basis of Design).
 - a. Products:
 - 1) Exterior: 601 T (Thermal).
 - 2) Interior: 451 (Non-thermal).
 2. EFCO Corporation
 3. Oldcastle BuildingEnvelope
 4. United States Aluminum
 5. YKK AP America Inc.

- B. Source Limitations: Obtain glazed aluminum curtain wall and aluminum-framed storefront and entrances through one source from a single manufacturer.
- C. Source Limitations: Obtain components of aluminum-framed entrance and storefront system, including framing and accessories, and glazed aluminum curtain wall system, from single manufacturer.
 - 1. Provide standard door hardware and electrified hardware as a single sourced package from same qualified supplier.

2.3 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308/B 308M.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 FRAMING SYSTEM

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally broken at exterior locations.
 - 2. Glazing System: Retained mechanically with gaskets on four sides typically.
 - 3. Glazing Plane: Center unless indicated otherwise.
 - 4. Framing Member Profile: 2 inches by 6 inches nominal dimension.
 - 5. Member Wall Thickness: Designed to meet structural performance requirements.
 - 6. Finish: Clear anodic finish.
 - 7. Fabrication Method: Field-fabricated stick system.
- B. Sill Pan: Extruded aluminum, factory fabricated to provide sealed end dams, finished to match storefront; designed to direct water away from building when installed horizontally at sill. If manufacturer offers a high-performance sill pan as part of aluminum-framed entrance and storefront system, submit details and product data including finishes, for consideration and approval by Architect.
 - 1. PVC is not acceptable.
- C. Cap Extender: Manufacturer's standard aluminum extrusion designed to snap-on to aluminum framing for increasing profile depth.
 - 1. Cap Extender Depth: As indicated on Drawings.
- D. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

- E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
 - 1. Roller Assemblies: Low-friction design.
- F. Perimeter Filler: Provide perimeter filler / backer plate to close back of frame and facilitate placement of backer rod and sealant.
 - 1. Back Plates: Furnish jamb and head framing members with manufacturer's standard continuous back plates, unless continuous plates are integral to the design of the framing system.
- G. Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.5 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's heavy-duty glazed entrance doors for manual-swing operation.
 - 1. Door Construction: 2-1/4 inch overall depth, with minimum 0.125 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.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 - 2. Door Design: Wide stile; 10-inch nominal width bottom stile; 6-inches nominal width side and top stiles.
 - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
 - b. Thermal Barriers: Two 1/4 inch separations consisting of a two-part chemically curing, high-density polyurethane that is mechanically and adhesively joined to aluminum storefront sections.
 - 1) Provide thermal barriers for exterior doors only.
 - 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.

2.6 ENTRANCE DOOR HARDWARE

- A. General: Except for items specified in this Article, entrance door hardware to be furnished under Section 087100 "Door Hardware."
 - 1. All hardware preparation and installation to be performed as Work of this Section.
- B. Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Compression Type: Made of ASTM D 2000 molded neoprene or ASTM D 2287 molded PVC.
 - 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.7 GLAZING

- A. Glazing: As specified in Section 088000 - Glazing.
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

1. Glazing Sealants: As recommended by manufacturer.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Weatherseal Sealant: ASTM C920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with other system components with which it comes in contact; recommended by weatherseal-sealant and glazed storefront manufacturers for this use.
- E. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.8 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.
 3. Use fasteners with countersunk Phillips screw heads fabricated from 300 series stainless steel.
- B. 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 or ASTM A153 requirements.
- C. Concealed Flashing: Dead-soft, 0.018 inch thick stainless steel, ASTM A240 of type recommended by manufacturer.
- D. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30 mil thickness per coat.
- E. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 079200 "Joint Sealants."

2.9 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 1. Profiles that are sharp, straight, and free of defects or deformations.
 2. Accurately fitted joints with ends coped or mitered.
 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 4. Physical and thermal isolation of glazing from framing members.
 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

6. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing.
 7. 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. Storefront Framing: Fabricate components for assembly using head-and-sill-receptor system with shear blocks at intermediate horizontal members.
- F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At exterior doors, provide compression weather stripping at fixed stops.
 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install 3 silencers on strike jamb of single-door frames and 2 silencers on head of frames for pairs of doors.
- G. 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.
- H. 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.
- I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- 2.10 ALUMINUM FINISHES
- A. Clear Anodic Finish, AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
1. Comply with manufacturer's written instructions.
 2. Do not install damaged components.
 3. Fit joints to produce hairline joints free of burrs and distortion.
 4. Rigidly secure nonmovement joints.
 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 6. Provide fasteners at spacing as recommended by manufacturer.
 7. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Installation at Sill: Install sill pan system in accordance with manufacturer's written instructions.
1. Set sill pan in a continuous bed of low modulus sealant or apply a nominal 6-inch-wide strip of 60 mil self-adhering waterproofing membrane to the bottom of the pan and where a penetration might be required to comply with specified performance requirements.
 2. Do not apply sealant between flashing pan and bottom of frame, except as required by manufacturer to comply with specified performance requirements. Set sill members in watertight sill flashing pan. Do not penetrate bottom of flashing pan and/or attach sill members to vertical leg of angle unless required by manufacturer to comply with specified performance requirements.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Install glazing as specified in Section 088000 - Glazing.
- G. Install weatherseal sealant per Section 079200 - Joint Sealants and per sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- H. Entrance Doors: Install 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 according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.3 ERECTION TOLERANCES

- A. Erection Tolerances: 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.

3.4 FIELD QUALITY CONTROL

- A. Contractor/Installer Testing: Contractor/Installer shall be prepared to provide the following minimum testing as part of the Work.
1. Testing shall be in compliance with AAMA 501.2. Testing shall be performed at approximately 10 percent and 50 percent completion. A minimum of 2 test areas to be tested at each phase. Additional testing may be required if installation crew changes or if construction is suspended and resumed after an extended period of time. Coordinate with Architect's representative for areas to be tested, testing times, and representative's availability to monitor tests.
- B. Testing Agency: Owner may engage a qualified independent testing and inspecting agency to perform field tests and inspections.
- C. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
1. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft., of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
 2. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform and cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under Part 1 "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.
- D. Repair or remove Work if test results and inspections indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional Work with specified requirements.
1. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

END OF SECTION 084113

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SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes mechanical door hardware.

1.2 administrative requirements

A. Coordination:

1. Installation Templates: Distribute for doors, frames, and other Work specified to be factory 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.
2. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
3. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.3 action SUBMITTALS

- A. Samples for Verification: For each type of exposed product, in each finish specified.

1. Sample Size: Full units or minimum 2-by-4-inch Samples for sheet and 4 inch long Samples for other products.
 - a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into Work, within limitations of keying requirements.

- B. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant (AHC). Coordinate door hardware schedule with doors, frames, and related Work to ensure proper size, thickness, hand, function, and finish of door hardware.

- C. Keying Schedule: Prepared by or under the supervision of WCPSS Lockshop detailing Owner's final keying instructions for locks from keying meeting where owner and manufacturer's representative are to be present. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Architectural Hardware Consultant.

- B. Product Certificates: For electrified door hardware.

1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

- C. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

- D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Data: For each type of door hardware to include in maintenance manuals, including the following:
 - 1. Maintenance instructions and warranty information for each item of hardware.
 - 2. Catalog pages for each product.
 - 3. Contact information for supplier of hardware and local representatives of each product manufacturer.
 - 4. Parts list for each product.
- B. Schedules: Final door hardware schedule, keying schedule, and wiring diagrams.

1.6 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.
- B. Maintenance Tools and Instructions: Furnish complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- C. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products, with minimum of five years' experience in installation of commercial hardware similar to that required for this Project, is an employer of workers trained and approved by product manufacturers, and employs an Architectural Hardware Consultant (AHC) who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.
- B. Architectural Hardware Consultant Qualifications: A 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 who is currently certified by DHI as an Architectural Hardware Consultant (AHC) and an Electrified Hardware Consultant (EHC).

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware to prevent damage during transit and storage. Deliver products in original unopened packaging with legible manufacturer's identification.
 - 1. Store hardware in a secured and dry environment to protect against loss, theft and damage.
- B. Deliver complete shipment of door hardware as detailed in Door Hardware Schedule and per approved Shop Drawings.
- C. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

1. Compare delivered hardware to approved Hardware Schedule. Report shortage of products or damaged products to Architect and supplier within 24 hours of delivery. Shortages not reported are Contractor's responsibility and will not be an additional cost to Owner.
 - D. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
 - E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- 1.9 WARRANTY
- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 1. Failures include the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 2. Warranty Period: Three years from date of Substantial Completion, except as follows:
 - a. Electromagnetic Locks: Five years from date of Substantial Completion.
 - b. Exit Devices: Two years from date of Substantial Completion.
 - c. Manual Closers: 10 years from date of Substantial Completion.
 - d. Locks and Latches: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled on Drawings to comply with requirements in this Section.
 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products. Where named manufacturers' products are not indicated, provide products complying with BHMA designations referenced.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 Door Hardware Schedule Article. Products are identified by using door hardware designations, as follows:
 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 Door Hardware Schedule Article.
 2. References to BHMA Designations: Where products are not specified by name, provide products complying with BHMA designations and requirements for description, quality, and function.
- C. Source Limitations: Obtain each type of door hardware from a single manufacturer unless indicated otherwise. Supplier to maintain a permanent office within 120 miles of Wake County's Rock Quarry Roads Service Center.
- D. Butt Hinges: BHMA A156.1.
 1. Manufacturers: Hager, Stanley, McKinney.
- E. Geared Continuous Hinges: BHMA A156.26, Grade 1.

1. Manufacturers: Pemko, Stanley, ABH.
- F. Locks and Latches: Mortise Locks: Grade 1.
1. Manufacturers: Best, Schlage, Sargent.
- G. Exit Devices: BHMA A 156.3, Grade 1.
1. Manufacturers: Precision, Von Duprin, Sargent.
- H. Door Closers: BHMA A 156.4, Grade 1
1. Manufacturers: LCN, Stanley, Norton.
- I. Flushbolts: BHMA A 156.16:
1. Manufacturer: Rockwood, ABH, Burns, Trimco.
- J. Push Plates, Pull Bars and Grips: BHMA A 156.6
1. Manufacturer: Rockwood, ABH, Burns, Trimco.
- K. Door Protection (Kick plates, mop plates and armor plate): BHMA A156.6.
1. Manufacturer: Rockwood, ABH, Burns, Trimco.
- L. Overhead Stops and Holders: Where scheduled.
1. Manufacturer: Rixson, Sargent, ABH
- M. Auxiliary Hardware
1. Silencers: BHMA A 156.16.
 - a. Basis of Design: Rockwood, ABH, Burns, Trimco
 2. Wall Stops (bumpers):
 - a. Basis of Design: Rockwood, ABH, Burns, Trimco
- 2.2 CYLINDERS, KEYING AND KEY CONTROL
- A. Cylinders and Cores: Best.
1. Keyed to Owner's existing patented system. Owner to approve all keying decisions and proposed key schedule during a keying conference. Hardware Supplier to install final cores.
 2. Hardware supplier to provide bittings, Best KS600IMP CD code import and KS600NDB facility data base upgrade.
 3. Provide three keys per core combination.
 4. Exterior locksets, locksets on mechanical and electrical rooms and exit devices shall be provided with construction key cores.
 5. No keys are to be stamped with bittings.
- B. Key Cabinet:
1. Manufacturer: Lund, Tel-kee P.O. Moor Company.
 2. Hardware Supplier shall supply, set up, compile Hook to Key Schedule, hang keys, and install key cabinet.
- C. Fire Department Access (Knox Box): Recessed, aluminum, satin finish.

1. Provide one of the following:
 - a. Knox Series 4400RDL Dual Key Box.

D.

PART 3 - EXECUTION

3.1 iNSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 2. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing Work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
 3. All hardware and cylinders/cores shall be installed by the hardware supplier. Final adjustments of all hardware shall be performed prior to building turn over. Installation shall be performed by the hardware supplier using personnel that are experienced in the installation of hardware for schools. Personnel shall have a minimum of 5 years of documented experience doing this type of work.
 - 4.

3.2 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed Work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.3 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
 2. All permanent cores will be installed for final adjustment of all locking and latching hardware.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, schedule Installer's Architectural Hardware Consultant to examine and readjust each item of door hardware, including operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.4 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation. Clean operating items as necessary to restore proper function and finish.
- B. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.5 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

Hardware Sets**Set: 1.0**

Description: EXTERIOR ALUM (SGL) RIM EXIT x PULL - CLOSER

1 Continuous Hinge	CFM_HD1	PE
1 Exit Device	2000 SERIES	PR
1 Permanent Core	AS REQUIRED	BE
1 Cylinder	AS REQUIRED x CONST CORE	BE
1 Door Closer	4040XP SERIES	LC
1 Door Stop	462	RO
1 Threshold	171A	PE
1 Rain Guard	346C	PE
1 Set Weatherstrip	BY DOOR MANUFACTURER	00

Set: 2.0

Description: EXTERIOR ALUM (PR) RIM EXITS x PULL - MULLION - CLOSER

2 Continuous Hinge	CFM_HD1	PE
1 Keyed Removable Mullion	KR822	PR
1 Exit Device	2000 SERIES	PR

1	Exit Device	2000 SERIES	PR
2	Permanent Core	AS REQUIRED	BE
2	Cylinder	AS REQUIRED x CONST CORE	BE
2	Overhead Stop	9 SERIES	RF
2	Door Closer	4040XP SERIES	LC
1	Threshold	171A	PE
1	Rain Guard	346C	PE
1	Mullion Gasketing	5110BL	PE
1	Set Weatherstrip	BY DOOR MANUFACTURER	00

Set: 3.0

Description: EXTERIOR ALUM (PR) ELECT RIM EXITS x PULL - MULLION - CLOSER - CARD READER

1	Continuous Hinge	CFM_HD1	PE
1	Elect Continuous Hinge	CFM_HD1 x SER	PE
1	Keyed Removable Mullion	KR822	PR
1	Exit Device	2000 SERIES	PR
1	Exit Device	2000 SERIES	PR
2	Permanent Core	AS REQUIRED	BE
2	Cylinder	AS REQUIRED x CONST CORE	BE
2	Door Closer	4040XP SERIES	LC
2	Door Stop	462	RO
1	Threshold	171A	PE
1	Rain Guard	346C	PE
1	Mullion Gasketing	5110BL	PE
1	Set Weatherstrip	BY DOOR MANUFACTURER	00
1	Card Reader	FURNISHED IN OTHER SECTION	00
1	Wiring Diagram	AS REQUIRED	OT
1	Power Supply	SERIES AS REQUIRED	PR

OPERATION: DOORS TO BE CLOSED AND LOCKED AT ALL TIMES UNLESS EXIT DEVICE PUSH BARS ARE IN THE DOGGED POSITION. WHEN LOCKED, PRESENTATION OF A VALID CARD SIGNAL ELECTRIC LATCH RETRACTION ALLOWING INGRESS. EGRESS AT ALL TIMES BY EXIT DEVICE PUSH BARS.

Set: 4.0

Description: EXTERIOR ALUM (PR) ELECT RIM EXITS x PULL - MULLION - AUTO OPERATOR - CARD READER

1	Continuous Hinge	CFM_HD1	PE
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1	Elect Continuous Hinge	CFM_HD1 x SER	PE
1	Keyed Removable Mullion	KR822	PR
1	Exit Device	2000 SERIES	PR
1	Exit Device	2000 SERIES	PR
1	Permanent Core	AS REQUIRED	BE
2	Cylinder	AS REQUIRED x CONST CORE	BE
1	Door Closer	4040XP SERIES	LC
1	Door Operator	4640 SERIES	LC
2	Door Stop	462	RO
1	Threshold	171A	PE
1	Rain Guard	346C	PE
1	Mullion Gasketing	5110BL	PE
1	Set Weatherstrip	BY DOOR MANUFACTURER	00
1	Card Reader	FURNISHED IN OTHER SECTION	00
1	Wiring Diagram	AS REQUIRED	OT
2	Actuator	8310-856T	LC
1	Power Supply	SERIES AS REQUIRED	PR

OPERATION: DOORS TO BE CLOSED AND LOCKED AT ALL TIMES UNLESS EXIT DEVICE PUSH BARS ARE IN THE DOGGED POSITION. WHEN LOCKED, PRESENTATION OF A VALID CARD SIGNAL ELECTRIC LATCH RETRACTION AND CYCLES AUTO OPERATOR ALLOWING INGRESS. EGRESS AT ALL TIMES BY EXIT DEVICE PUSH BARS.

Set: 5.0

Description: EXTERIOR HM (SGL) ELECT RIM EXITS x PULL - MULLION - CLOSER - CARD READER

	Hinge	T4A3386 x NRP	MK
	Electric Hinge	T4A3386 x QC	MK
1	Exit Device	2000 SERIES	PR
1	Permanent Core	AS REQUIRED	BE
1	Cylinder	AS REQUIRED x CONST CORE	BE
1	Door Closer	4040XP SERIES	LC
1	Kick Plate	K3125 SERIES	RO
1	Door Stop	462	RO

1	Threshold	2005AT	PE
1	Set Weatherstrip	303AS	PE
1	Rain Guard	346C	PE
1	Set Weatherstrip	BY DOOR MANUFACTURER	00
1	Door Bottom Sweep	3452CNB	PE
1	Card Reader	FURNISHED IN OTHER SECTION	00
1	Wiring Diagram	AS REQUIRED	OT
1	Power Supply	SERIES AS REQUIRED	PR

OPERATION: DOORS TO BE CLOSED AND LOCKED AT ALL TIMES UNLESS EXIT DEVICE PUSH BARS ARE IN THE DOGGED POSITION. WHEN LOCKED, PRESENTATION OF A VALID CARD SIGNAL ELECTRIC LATCH RETRACTION ALLOWING INGRESS. EGRESS AT ALL TIMES BY EXIT DEVICE PUSH BARS.

Set: 6.0

Description: EXTERIOR HM (PR) ELECT RIM EXITS x PULL - MULLION - CLOSER - CARD READER

	Hinge	T4A3386 x NRP	MK
	Electric Hinge	T4A3386 x QC	MK
1	Keyed Removable Mullion	KR822	PR
1	Exit Device	2000 SERIES	PR
1	Exit Device	2000 SERIES	PR
2	Permanent Core	AS REQUIRED	BE
2	Cylinder	AS REQUIRED x CONST CORE	BE
2	Door Closer	4040XP SERIES	LC
2	Kick Plate	K3125 SERIES	RO
2	Door Stop	462	RO
1	Threshold	2005AT	PE
1	Set Weatherstrip	303AS	PE
1	Rain Guard	346C	PE
1	Mullion Gasketing	5110BL	PE
1	Set Weatherstrip	BY DOOR MANUFACTURER	00
2	Door Bottom Sweep	3452CNB	PE
1	Card Reader	FURNISHED IN OTHER SECTION	00
1	Wiring Diagram	AS REQUIRED	OT
1	Power Supply	SERIES AS REQUIRED	PR

OPERATION: DOORS TO BE CLOSED AND LOCKED AT ALL TIMES UNLESS EXIT DEVICE PUSH BARS ARE IN THE DOGGED POSITION. WHEN LOCKED, PRESENTATION OF A VALID CARD SIGNAL ELECTRIC LATCH RETRACTION ALLOWING INGRESS. EGRESS AT ALL TIMES BY EXIT DEVICE PUSH BARS.

Set: 7.0

Description: EXTERIOR HM (SGL) RIM EXIT x PULL - CLOSER

Hinge	T4A3386 x NRP	MK
1 Exit Device	2000 SERIES	PR
1 Permanent Core	AS REQUIRED	BE
1 Cylinder	AS REQUIRED x CONST CORE	BE
1 Overhead Stop	9 SERIES	RF
1 Door Closer	4040XP SERIES	LC
1 Kick Plate	K3125 SERIES	RO
1 Threshold	2005AT	PE
1 Set Weatherstrip	303AS	PE
1 Rain Guard	346C	PE
1 Mullion Gasketing	5110BL	PE
1 Door Bottom Sweep	3452CNB	PE

Set: 8.0

Description: EXTERIOR HM (PR) RIM EXITS x PULL - MULLION - CLOSER

Hinge	T4A3386 x NRP	MK
1 Keyed Removable Mullion	KR822	PR
1 Exit Device	2000 SERIES	PR
1 Exit Device	2000 SERIES	PR
2 Permanent Core	AS REQUIRED	BE
2 Cylinder	AS REQUIRED x CONST CORE	BE
2 Overhead Stop	9 SERIES	RF
2 Door Closer	4040XP SERIES	LC
2 Kick Plate	K3125 SERIES	RO
1 Threshold	2005AT	PE
1 Set Weatherstrip	303AS	PE
1 Rain Guard	346C	PE
1 Mullion Gasketing	5110BL	PE
1 Set Weatherstrip	BY DOOR MANUFACTURER	00
2 Door Bottom Sweep	3452CNB	PE

Set: 9.0

Description: EXTERIOR HM (SGL) STOREROOM LOCK - CLOSER

Hinge	T4A3386 x NRP	MK
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1	Storeroom Lock	40H SERIES x CONST CORE	BE
1	Permanent Core	AS REQUIRED	BE
1	Cylinder	AS REQUIRED x CONST CORE	BE
1	Door Closer	4040XP SERIES	LC
1	Kick Plate	K3125 SERIES	RO
1	Door Stop	462	RO
1	Threshold	2005AT	PE
1	Set Weatherstrip	303AS	PE
1	Rain Guard	346C	PE
1	Door Bottom Sweep	3452CNB	PE

Set: 10.0

Description: EXTERIOR HM (PR) STOREROOM LOCK - CFB - CLOSER

	Hinge	T4A3386 x NRP	MK
1	Set Combo Flush Bolts	2845/2945	RO
1	Dust Proof Strike	570	RO
1	Storeroom Lock	40H SERIES x CONST CORE	BE
1	Permanent Core	AS REQUIRED	BE
1	Cylinder	AS REQUIRED x CONST CORE	BE
1	Coordinator	2600 x FILLER BAR x CLOSER MTG BRKTS AS REQ'D	RO
2	Door Closer	4040XP SERIES	LC
2	Kick Plate	K3125 SERIES	RO
2	Door Stop	462	RO
1	Threshold	2005AT	PE
1	Set Weatherstrip	303AS	PE
1	Rain Guard	346C	PE
2	Door Bottom Sweep	3452CNB	PE
1	Set Astragal	18041CNB	PE

Set: 11.0

Description: INTERIOR ALUM (PR) RIM EXITS x PULL - MULLION - CLOSER

2	Continuous Hinge	CFM_HD1	PE
1	Keyed Removable Mullion	KR822	PR
1	Exit Device	2000 SERIES	PR
1	Exit Device	2000 SERIES	PR
2	Permanent Core	AS REQUIRED	BE
2	Cylinder	AS REQUIRED x CONST CORE	BE
2	Overhead Stop	9 SERIES	RF

2 Door Closer	4040XP SERIES	LC
1 Set Door Seals	BY DOOR MANUFACTURER	00

Set: 12.0

Description: INTERIOR ALUM (PR) ELECT RIM EXITS x PULL - MULLION - CARD READER

1 Continuous Hinge	CFM_HD1	PE
1 Elect Continuous Hinge	CFM_HD1 x SER	PE
1 Keyed Removable Mullion	KR822	PR
1 Exit Device	2000 SERIES	PR
1 Exit Device	2000 SERIES	PR
2 Permanent Core	AS REQUIRED	BE
2 Cylinder	AS REQUIRED x CONST CORE	BE
2 Overhead Stop	9 SERIES	RF
2 Door Closer	4040XP SERIES	LC
1 Set Door Seals	BY DOOR MANUFACTURER	00
1 Mullion Gasketing	5110BL	PE
1 Card Reader	FURNISHED IN OTHER SECTION	00
1 Wiring Diagram	AS REQUIRED	OT
1 Power Supply	SERIES AS REQUIRED	PR

OPERATION: DOORS TO BE CLOSED AND LOCKED AT ALL TIMES UNLESS EXIT DEVICE PUSH BARS ARE IN THE DOGGED POSITION. WHEN LOCKED, PRESENTATION OF A VALID CARD SIGNAL ELECTRIC LATCH RETRACTION ALLOWING INGRESS. EGRESS AT ALL TIMES BY EXIT DEVICE PUSH BARS.

Set: 13.0

Description: INTERIOR ALUM (PR) ELECT RIM EXITS x PULL - MULLION - AUTO OPERATOR - CARD READER

1 Continuous Hinge	CFM_HD1	PE
1 Elect Continuous Hinge	CFM_HD1 x SER	PE
1 Keyed Removable Mullion	KR822	PR
1 Exit Device	2000 SERIES	PR
1 Exit Device	2000 SERIES	PR
1 Permanent Core	AS REQUIRED	BE

1 Cylinder	AS REQUIRED x CONST CORE	BE
1 Door Closer	4040XP SERIES	LC
1 Door Operator	4640 SERIES	LC
2 Door Stop	462	RO
1 Mullion Gasketing	5110BL	PE
1 Set Weatherstrip	BY DOOR MANUFACTURER	00
1 Card Reader	FURNISHED IN OTHER SECTION	00
1 Wiring Diagram	AS REQUIRED	OT
2 Actuator	8310-856T	LC
1 Power Supply	SERIES AS REQUIRED	PR

OPERATION: DOORS TO BE CLOSED AND LOCKED AT ALL TIMES UNLESS EXIT DEVICE PUSH BARS ARE IN THE DOGGED POSITION. WHEN LOCKED, PRESENTATION OF A VALID CARD SIGNAL ELECTRIC LATCH RETRACTION AND CYCLES AUTO OPERATOR ALLOWING INGRESS. EGRESS AT ALL TIMES BY EXIT DEVICE PUSH BARS.

Set: 14.0

Description: INTERIOR ALUM (SGL) - ELECTRIFIED LOCK - CLOSER - CARD READER/REMOTE RELEASE

1 Elect Continuous Hinge	CFM_HD1 x SER	PE
1 Electrified Mortise Lock	40H SERIES x CONST CORE	BE
1 Overhead Stop	9 SERIES	RF
1 Door Closer	4040XP SERIES	LC
1 Set Door Seals	BY DOOR MANUFACTURER	00
1 Card Reader	FURNISHED IN OTHER SECTION	00
1 Wiring Diagram	AS REQUIRED	OT
1 Door Release	TS-18	AK
1 Power Supply	SERIES AS REQUIRED	PR

OPERATION: DOORS TO BE CLOSED AND LOCKED AT ALL TIMES. PRESENTATION OF A VALID CARD OR INPUT FROM DOOR RELEASE UNLOCKS OUTSIDE LEVER AND ALLOWS INGRESS. EGRESS BY INSIDE LEVER AT ALL TIMES.

Set: 15.0

Description: INTERIOR ALUM (SGL) CLASSROOM LOCK

1 Continuous Hinge	CFM_HD1	PE
1 Classroom Lock	40H SERIES x CONST CORE	BE
1 Permanent Core	AS REQUIRED	BE
1 Cylinder	AS REQUIRED x CONST CORE	BE
1 Wall Stop	406	RO

1 Set Door Seals	BY DOOR MANUFACTURER	00
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Set: 16.0

Description: INTERIOR ALUM (SGL) CLASSROOM INTRUDER LOCK

1 Continuous Hinge	CFM_HD1	PE
1 Classroom Intruder Lock	40H SERIES x CONST CORE	BE
2 Permanent Core	AS REQUIRED	BE
1 Wall Stop	406	RO
1 Set Door Seals	BY DOOR MANUFACTURER	00

Set: 17.0

Description: INTERIOR (SGL) RIM EXIT x LEVER - CLOSER

Hinge	TA2714	MK
1 Exit Device	2000 SERIES	PR
1 Door Closer	4040XP SERIES	LC
1 Kick Plate	K3125 SERIES	RO
1 Wall Stop	406	RO
3 Silencer	608	RO

Set: 18.0

Description: INTERIOR (SGL) UL RIM EXIT x LEVER - CLOSER

Hinge	TA2714	MK
1 Exit Device	2000 SERIES	PR
1 Door Closer	4040XP SERIES	LC
1 Kick Plate	K3125 SERIES	RO
1 Wall Stop	406	RO
1 Set Door Seals	S88D	PE

Set: 19.0

Description: INTERIOR (PR) RIM EXITS x PULL - MULLION - CLOSER

Hinge	T4A3786	MK
1 Keyed Removable Mullion	KR822	PR
1 Exit Device	2000 SERIES	PR
1 Exit Device	2000 SERIES	PR
2 Permanent Core	AS REQUIRED	BE

2 Cylinder	AS REQUIRED x CONST CORE	BE
2 Door Closer	4040XP SERIES	LC
2 Kick Plate	K3125 SERIES	RO
2 Wall Stop	406	RO
2 Silencer	608	RO

Set: 20.0

Description: INTERIOR (PR) UL RIM EXITS x LEVER - MULLION - CLOSER

6 Hinge	T4A3786	MK
1 Keyed Removable Mullion	FLKR822	PR
1 Exit Device	2000 SERIES	PR
1 Exit Device	2000 SERIES	PR
1 Permanent Core	AS REQUIRED	BE
1 Cylinder	AS REQUIRED x CONST CORE	BE
2 Door Closer	4040XP SERIES	LC
2 Kick Plate	K3125 SERIES	RO
2 Wall Stop	406	RO
1 Set Door Seals	S88D	PE
1 Mullion Gasketing	5110BL	PE

Set: 21.0

Description: INTERIOR (PR) UL RIM EXITS x LEVER - MULLION - CLOSER - MAG HOLD

Hinge	T4A3786	MK
1 Keyed Removable Mullion	FLKR822	PR
1 Exit Device	2000 SERIES	PR
1 Exit Device	2000 SERIES	PR
1 Permanent Core	AS REQUIRED	BE
1 Cylinder	AS REQUIRED x CONST CORE	BE
2 Door Closer	4040XP SERIES	LC
2 Kick Plate	K3125 SERIES	RO
2 Electromagnetic Holder	990 SERIES	RF
1 Set Door Seals	S88D	PE
1 Mullion Gasketing	5110BL	PE

NOTE: ELECTROMAGNETIC HOLDERS TO BE TIED INTO FIRE ALARM SYSTEM.

Set: 22.0

Description: INTERIOR (SGL) PASSAGE SET

Hinge	TA2714	MK
1 Passage Latch	40H SERIES	BE
1 Wall Stop	406	RO
3 Silencer	608	RO

Set: 23.0

Description: INTERIOR (SGL) PRIVACY SET W/ INDICATOR - CLOSER

Hinge	TA2714	MK
1 Privacy Lock	40H SERIES x CONST CORE	BE
1 Surface Closer	4040XP SERIES	LC
1 Kick Plate	K3125 SERIES	RO
1 Wall Stop	406	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED	PE

Set: 24.0

Description: INTERIOR (SGL) OFFICE LOCK

Hinge	TA2714	MK
1 Office Lock	40H SERIES x CONST CORE	BE
1 Permanent Core	AS REQUIRED	BE
1 Wall Stop	406	RO
3 Silencer	608	RO

Set: 25.0

Description: INTERIOR (SGL) CLASSROOM LOCK

Hinge	TA2714	MK
1 Classroom Lock	40H SERIES x CONST CORE	BE
1 Permanent Core	AS REQUIRED	BE
1 Wall Stop	406	RO
3 Silencer	608	RO

Set: 26.0

Description: INTERIOR (SGL) CLASSROOM LOCK - CLOSER

Hinge	TA2714	MK
1 Classroom Lock	40H SERIES x CONST CORE	BE
1 Permanent Core	AS REQUIRED	BE

1 Door Closer	4040XP SERIES	LC
1 Kick Plate	K3125 SERIES	RO
1 Wall Stop	406	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED	PE

Set: 27.0

Description: INTERIOR (SGL) STOREROOM LOCK

Hinge	TA2714	MK
1 Storeroom Lock	40H SERIES x CONST CORE	BE
1 Permanent Core	AS REQUIRED	BE
1 Wall Stop	406	RO
3 Silencer	608	RO

Set: 28.0

Description: INTERIOR (SGL) STOREROOM LOCK - CLOSER

Hinge	TA2714	MK
1 Storeroom Lock	40H SERIES x CONST CORE	BE
1 Permanent Core	AS REQUIRED	BE
1 Door Closer	4040XP SERIES	LC
1 Kick Plate	K3125 SERIES	RO
1 Wall Stop	406	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED	PE

Set: 29.0

Description: INTERIOR (SGL) CLASSROOM INTRUDER LOCK

Hinge	TA2714	MK
1 Classroom Intruder Lock	40H SERIES x CONST CORE	BE
2 Permanent Core	AS REQUIRED	BE
1 Wall Stop	406	RO
3 Silencer	608	RO

Set: 30.0

Description: INTERIOR (SGL) CLASSROOM INTRUDER LOCK - SEALS/DOOR BOTTOM

Hinge	TA2714	MK
1 Classroom Intruder Lock	40H SERIES x CONST CORE	BE

2 Permanent Core	AS REQUIRED	BE
1 Wall Stop	406	RO
1 Set Door Seals	S88D	PE
1 Auto Door Bottom	411ARL	PE

Set: 31.0

Description: INTERIOR (PR) CLASSROOM LOCK - CFB - CLOSER

Hinge	TA2714	MK
1 Set Combo Flush Bolts	2845/2945	RO
1 Dust Proof Strike	570	RO
1 Classroom Lock	40H SERIES x CONST CORE	BE
1 Permanent Core	AS REQUIRED	BE
2 Door Closer	4040XP SERIES	LC
2 Kick Plate	K3125 SERIES	RO
2 Wall Stop	406	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED	PE

Set: 32.0

Description: INTERIOR (PR) STOREROOM LOCK - CFB - CLOSER

Hinge	TA2714	MK
1 Set Combo Flush Bolts	2845/2945	RO
1 Dust Proof Strike	570	RO
1 Storeroom Lock	40H SERIES x CONST CORE	BE
1 Permanent Core	AS REQUIRED	BE
2 Door Closer	4040XP SERIES	LC
2 Kick Plate	K3125 SERIES	RO
2 Wall Stop	406	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED	PE

Set: 33.0

Description: INTERIOR (SGL) PUSH/PULL - CLOSER

Hinge	TA2714	MK
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1 Push Plate	70F	RO
1 Pull Plate	111x70C	RO
1 Door Closer	4040XP SERIES	LC
1 Kick Plate	K3125 SERIES	RO
1 Wall Stop	406	RO
3 Silencer	608	RO

END OF SECTION 087100

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SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. 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. Doors.
 - 2. Storefront framing.
 - 3. Glazed entrances.
 - 4. One way vision glazing

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 - Project Management and Coordination.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- C. Glazing Accessory Samples: For gaskets, and colored spacers, in 12 inch lengths.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturers of insulating-glass units with sputter-coated, low-E coatings, glass testing agency and sealant testing agency.
- B. Product Certificates: For glass and glazing products.
- C. Product Test Reports: For insulating glass and glazing gaskets, for tests performed by a qualified testing agency.
- D. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.
- B. 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.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 - 1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 - 2. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - 3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 - 4. Schedule sufficient time for testing and analyzing results to prevent delaying Work.
 - 5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

1.7 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.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 FIELD 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 glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 degrees F.

1.9 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

- B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to 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. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Subject to compliance with requirements, provide basis of design indicated in Glass Schedule or comparable product by one of the following:
1. Guardian Industries.
 2. Viracon.
 3. Vitro Glass.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- C. 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 wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following:
1. Defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 - Quality Requirements, to design glazing.
- C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E1300:
1. Design Wind Pressures: As indicated on Drawings.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Roller Wave Distortion: Maximum of 0.003 inch from peak to valley in the center of lite, and a maximum of 0.008 inch within 10.5 inches of the leading or trailing edge.
- F. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 3. U-Factors: Center-of-glazing values, per NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.

4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: Glazing Manual.
 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IgCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated or required by applicable code, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) as 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.
- C. Reflective-Coated Vision Glass: ASTM C 1376, tinted, fully-tempered, coated by pyrolytic process, and complying with other requirements specified. Glass shall be designed for unobserved observation from one side in light ratio of no more than 1:8.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with polyisobutylene primary and silicone secondary or as recommended by manufacturer for application.
2. Spacer Material: Aluminum with mill or anodized finish.
3. Desiccant: Molecular sieve or silica gel, or blend of both.

2.6 MONOLITHIC GLASS SCHEDULE

- A. Glass Type TG (GL31): Clear, fully tempered float glass, 6.0 mm.
- B. Glass Type OWM (GL32): Reflective-coated vision glass.
 1. Basis-of-Design Product: Pilkington Mirropane.
 2. Thickness: 1/4-inch.
 3. Provide safety glazing labeling.
 4. Kind: Kind CV (coated vision glass).

2.7 INSULATING GLASS SCHEDULE

- A. Glass Type TNE (GL11): Clear, low-e insulating-glass units, tempered.
 1. Basis-of-Design: Guardian; SunGuard SNR 43
 2. Overall Unit Thickness: 1 inch.
 3. Thickness of Each Glass Lite: 6.0 mm.
 4. Outdoor Lite: Clear, fully tempered float glass.
 5. Interspace Content: Dehydrated air.
 6. Indoor Lite: Clear, fully tempered float glass.
 7. Low-E Coating: Sputtered on second surface.
 8. Transmittance:
 - a. Visible Light Transmittance: 43 percent.
 - b. Total Solar Energy: 19 percent.
 9. Exterior Reflectance:
 - a. Visible Light Reflectance - In: 28 percent.
 - b. Visible Light Reflectance - Out: 14 percent.
 - c. Solar Energy Reflectance: 43 percent.
 10. NFRC U-Values:
 - a. Winter Nighttime U-Factor: 0.29 Btu.
 - b. Summer Daytime U-Factor: 0.27 Btu.
 11. Solar Heat Gain Coefficient (SHGC): 0.23
 12. Light to Solar Gain (LSG): 1.89

2.8 GLAZING GASKETS

- A. Compression Gaskets: Molded or extruded gaskets of type and material indicated below and of profile and hardness required to maintain watertight seal:
 1. Silicone dense compression gaskets complying with ASTM C 1115.
 2. Silicone soft compression gaskets complying with ASTM C 509, Type II, black.

2.9 GLAZING SEALANTS

- A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation: 790.
 - b. May National Associates, Inc.; Bondaflex Sil 290
 - c. Momentive Performance Materials: SCS2700 Silpruf LM.
 - d. Pecora Corporation: 890NST.
 - e. Sika Corporation: Sikasil WS-290.
 - f. Tremco Incorporated: Spectrem 1.

2.10 GLAZING TAPES

- A. 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 C1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. 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; 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.

2.11 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with 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 of 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.

2.12 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.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, 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 systems.
 - 3. Minimum required face and 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 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. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. 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.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. 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.
- K. 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, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 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. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.7 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.

3.8 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. 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. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces 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 088000

SECTION 088813 - FIRE-RATED GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fire-resistance-rated glazing.

1.2 DEFINITIONS

- A. Fire-Resistance-Rated Glazing: Glazing that prevents spread of fire and smoke and radiant heat and complies with requirements for rated walls and rated openings; capable of blocking radiant heat
- B. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- C. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.

1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product; 12 inches square.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and glass testing agency.
- B. Product Certificates: For each type of glass and glazing product.
- C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the NGA's Certified Glass Installer Program.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during remainder of construction period.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Glass: For each glass type, obtain from single source from single manufacturer.
- B. Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

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 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. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. NGA Publications: "Glazing Manual."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or 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. Tempered Float Glass: ASTM C1048, 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.

2.5 FIRE-RESISTANCE-RATED GLAZING

- A. General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing in accordance with ASTM E119 or UL 263.
- B. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that glazing is approved for use in walls, and fire-resistance rating in minutes.

- C. Fire-Resistance-Rated Tempered Glazing Units with Clear Intumescent Interlayer: Glazing units made from two or more lites of uncoated, fully tempered, clear float glass; with a perimeter edge seal enclosing a cavity filled with optically clear, intumescent polymer; complying with 16 CFR 1201, Category II.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Pilkington Fire Protection Glass.
 - b. SAFTI FIRST Fire Rated Glazing Solutions.
 - c. SCHOTT North America.
 - d. Technical Glass Products.
 - e. Vetrotech Saint-Gobain North America.

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-resistant glazing products with which products are used for applications and fire-protection ratings indicated.
- B. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C920, 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow.
 - b. Pecora Corporation.
 - c. Sika Corporation.
 - d. Tremco Commercial Sealants & Waterproofing.
 2. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of industry colors.
- 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 C1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. 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 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, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

- C. Perimeter Insulation for Fire-Resistance-Rated Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.8 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.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 2. Provide 1/8-inch- minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.
- I. Set glass lites with proper orientation so that coatings face fire side or protected side as specified.
- J. 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.
- K. 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 in writing 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. 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. 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 wash away 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 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 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 088813

SECTION 089000 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Fixed, extruded-aluminum louvers.
 2. Wall vents.

1.2 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. 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.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
1. Wind Loads: As indicated on Structural Drawings.
- B. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
1. Design earthquake spectral response acceleration, short period (Sds) for Project is indicated on Structural Drawings.
 2. Component Importance Factor is 1.0.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- 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.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of metal finish required.

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. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 WARRANTY

A. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

1. Airolite Company, LLC (The).
2. Benchmark Fabricating
3. Reliable Products, Inc.
4. United Enertech Corp.

5. American Warming and Ventilating.

2.2 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver:

1. Basis-of-Design Product: Airolite CB6774.
2. Louver Depth: 4 inches.
3. Blade Profile: Plain blade without center baffle.
4. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.080 inch for blades and 0.080 inch for frames.
5. Mullion Type: Concealed.
6. Performance Requirements: Minimum 40 percent free area.
7. Finish: High-performance organic finish.

2.3 LOUVER SCREENS

A. General:

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird 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 kind and form of metal as indicated for louver to which screens are attached.
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. Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire.

2.4 BLANK-OFF PANELS

- ### A. Insulated, Blank-Off Panels: Provide blank-off panel at each exterior louver unless noted otherwise.

- ### B. Laminated panels consisting of insulating core surfaced on back and front with metal sheets and attached to back of louver.

1. Thickness: 1 inch.
2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
3. Insulating Core: extruded-polystyrene foam.
4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness, with corners mitered and with same finish as panels.
5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
6. Panel Finish: Same type of finish applied to louvers, but black color.

2.5 WALL VENTS

- ### A. Extruded-Aluminum Wall Vents:

1. Extruded-aluminum louvers and frames, not less than 0.125-inch nominal thickness, assembled by welding; with 18-by-14- mesh, aluminum insect screening on inside face; incorporating weep holes, continuous drip at sill, and integral waterstop on inside edge of sill; of load-bearing design and construction.
2. Dampers: Aluminum blades and frames mounted on inside of wall vents; operated from exterior with Allen wrench in socket-head cap screw. Fabricate operating mechanism from Type 304 stainless-steel components.
3. Finish: High-performance organic finish.

2.6 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 Phillips flat-head 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. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.7 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
 1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
 2. Horizontal Mullions: Provide horizontal mullions at joints where indicated.
- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
 1. Frame Type: Channel unless otherwise indicated.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches o.c., whichever is less.
 1. Fully Recessed Mullions: Where width of panel requires additional vertical support, 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. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

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.

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.9 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: 2-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 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.

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 and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

- F. Protect unpainted nonferrous-metal surfaces that will be 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.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.
- B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- D. Restore louvers and vents 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 089000

SECTION 092119 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes gypsum board shaft wall assemblies.

1.2 ACTION SUBMITTALS

- A. Product Data: For each gypsum board shaft-wall assembly indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For shaft wall assemblies, from ICC-ES.

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 C840 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 discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated per ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested per ASTM E90 and classified per ASTM E413 by a testing and inspecting agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. Fire-Resistance Rating: As indicated on Drawings.

- B. STC Rating: As indicated on Drawings.
- C. 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.
- D. 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: Matching steel studs.
- E. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.
- F. 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.
- G. Room-Side Finish: As indicated on Drawings.
- H. Shaft-Side Finish: Gypsum shaftliner board, Type X.
- I. Insulation: Sound attenuation blankets.

2.3 PANEL PRODUCTS

- A. Gypsum Shaftliner Board, Type X: ASTM C1396; manufacturer's proprietary fire-resistive liner panels with paper faces.
 - 1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum; Shaft Liner.
 - b. CertainTeed Corp.; ProRoc Shaftliner.
 - c. Georgia-Pacific Gypsum LLC; ToughRock Fireguard Shaftliner.
 - d. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner.
 - e. USG Corporation; Sheetrock Brand Gypsum Liner Panel.
 - 2. Thickness: 1 inch.
 - 3. Long Edges: Double bevel.
 - 4. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced product standards and manufacturer's written recommendations.
- B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Section 092900 "Gypsum Board" that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.
- C. Steel Drill Screws: ASTM C1002, 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 per ASTM E488 conducted by 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 per ASTM E1190 conducted by qualified testing agency.
- E. Sound Attenuation Blankets: ASTM C665, Type I, as specified in Section 092900 "Gypsum Board."
- F. Acoustical Joint Sealant: As specified in Section 079200 "Joint Sealants."

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 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 C754 other than stud-spacing requirements.
- B. Do not bridge architectural or 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, and similar items that cannot be supported directly by shaft-wall assembly framing.
 1. Elevator Hoistways: 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 1 layer of gypsum board 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 per ASTM C840 and in specific locations approved by Architect or as indicated on Drawings, 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. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with ASTM C 919 requirements or with manufacturer's written instructions, whichever are more stringent.
- 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.

3.3 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 discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092119

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.

B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.
2. Section 092900 "Gypsum Board."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. For partitions requiring seismic bracing, submit coordinated set of partition anchorage drawings prior to installation including the following:
 - a. Description, layout, and location of items to be anchored or braced with anchorage or brace points noted and dimensioned.
 - b. Details of anchorage or bracing at large scale with all members, parts brackets shown, together with all connections, bolts, and welds clearly identified.
 - c. Numeric value of design seismic brace loads.
2. For head-of-wall fire-resistive joint systems incorporating proprietary firestop track with intumescent strips, include design designations and documentation, including illustrations from a qualified testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.

1.3 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 and firestop tracks, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

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.

2.2 FRAMING SYSTEMS

- A. 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.
- B. Studs and Tracks: ASTM C 645. Use either steel studs and tracks or embossed steel studs and tracks.
1. Steel Studs and Tracks:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) CEMCO; California Expanded Metal Products Co.
 - 2) ClarkDietrich Building Systems LLC.
 - 3) MBA Building Supplies.
 - 4) MRI Steel Framing, LLC.
 - 5) Phillips Manufacturing Co.
 - 6) Steel Network, Inc. (The).
 - 7) Telling Industries.
 - b. Minimum Base-Metal Thickness: 0.0179 inch for gypsum wallboard, minimum 0.312 inch for tile backing panels, or greater as recommended by tile backer panel manufacturer, or greater as indicated in the manufacturer's published performance data based on the following criteria:
 - 1) Yield of strength of steel.
 - 2) Deflection Limits:
 - a) Gypsum Wallboard: L-240.
 - b) Ceramic Tile: L/360.
 - c) Plaster: L/360.
 - 3) Limiting Heights: As indicated on Drawings.
 - 4) Spans: As indicated on Drawings or as recommended by manufacturer.
 - 5) Applied loads composite or non-composite construction, as appropriate:
 - a) Gypsum wallboard: 5 psf.
 - b) Ceramic tile, one side: 15 psf.
 - c) Ceramic tile, two sides: 30 psf.
 - d) Gypsum plaster, one side: 15 psf.
 - e) Gypsum plaster, two sides: 30 psf.
 - c. 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) CEMCO; California Expanded Metal Products Co.
 - 2) ClarkDietrich Building Systems LLC.
 - 3) Marino\WARE.

- 4) MBA Building Supplies.
 - 5) Phillips Manufacturing Co.
 - 6) Steel Network, Inc. (The).
 - 7) Telling Industries.
- b. Minimum Base-Metal Thickness: Of equivalent thickness to conventional studs and runners, based on criteria above, and validated by independent third party testing .
- c. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Provide one of the following:
1. 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) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
 - 2) MBA Building Supplies; Slotted Deflecto Track.
 - 3) Steel Network Inc. (The); VertiClip SLD Series.
 - 4) Superior Metal Trim; Superior Flex Track System (SFT).
 - 5) Telling Industries; Vertical Slip Track.
- D. 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. 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.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.
 - 2) Grace Construction Products; FlameSafe FlowTrak System.
 - 3) Marino\WARE; Fas Track.
 - 4) Metal-Lite, Inc.; The System.
 2. Top runner with intumescent strip, 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.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) ClarkDietrich Building Systems; Blazeframe DSL.
 - 2) CEMCO; California Expanded Metal Company; Fas Track 1000.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width per veneer manufacturer's requirements..
- F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.
1. Depth: As indicated on Drawings.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: 0.0329 inch.
 2. Depth: As indicated on Drawings.

- H. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical or hat shaped, as indicated by partition type.
 2. Provide resilient furring channels to meet required STC rating as indicated by partition type on Drawings.
- I. 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.
- J. 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.
- K. Channel Brackets: Minimum depth of 1.6875 inch.

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. Hanger Attachments to Concrete:
1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Uses: Securing hangers to structure.
 - b. Type: Cast-in-place anchor, designed for attachment to concrete forms or postinstalled, expansion anchor.
 2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- 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: 0.0329 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: 0.0329 inch.
- 5. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
 - 1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

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.
- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 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.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- E. Direct Furring:
 1. Screw to wood framing.
 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

- F. Z-Shaped Furring Members:
1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced per veneer manufacturer's requirements.
 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 per veneer manufacturer's requirements.
 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.
- G. 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.
- 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. Do not attach hangers to steel roof deck.
 5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- 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 092216

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SECTION 092713 - GLASS FIBER-REINFORCED GYPSUM FABRICATIONS**PART 1 - GENERAL****1.1 SUMMARY****A. Section includes:**

1. Factory-molded, glass-reinforced gypsum fabrications for interior column covers.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of glass-reinforced gypsum fabrication indicated. Include construction details, material descriptions, weights, dimensions of individual components and profiles, and finishes.**B. Shop Drawings:** Show profiles, thicknesses, finishes, joints, installation tolerances, and anchorage details. Indicate attachment methods, embedded supports, reinforcement, fabrication methods, joint treatments, clearances, and supports.

1. Show connection to suspension system and cutouts for sprinklers, diffusers, grilles, speakers, and lighting fixtures.

1.3 INFORMATIONAL SUBMITTALS**A. Product Test Reports:** Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, indicating current glass-reinforced gypsum fabrications comply with ASTM C 1355/C 1355M requirements.**1.4 QUALITY ASSURANCE****A. Installer Qualifications:** An experienced installer who has completed glass-reinforced gypsum fabrication installations similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.**B. Testing Agency Qualifications:** An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.**C. Fire-Test-Response Characteristics:** Provide glass-reinforced gypsum fabrications with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another independent testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame Spread: 25 or less.
2. Smoke Developed: 450 or less.

1.5 DELIVERY, STORAGE, AND HANDLING**A. Ship and store glass-reinforced gypsum fabrications in factory-wrapped crates, packaged to keep units dry. Avoid cracking, warping, or staining the units.****B. Comply with manufacturer's written instructions for storage, temperature, and humidity requirements.**

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install glass-reinforced gypsum fabrications until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Acclimatize glass-reinforced gypsum fabrications to ambient temperature and humidity of spaces in which they will be installed. Remove packaging and move units into installation spaces not less than 48 hours before installing them.
- C. Field Measurements: Where glass-reinforced gypsum fabrications 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.

1.7 COORDINATION

- A. Coordinate layout and installation of glass-reinforced gypsum fabrications and suspension system components with other construction, including ceilings, light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Casting Designs, Inc.
 - 2. Formglas, Inc.
 - 3. Stromberg Architectural Products, Inc.

2.2 GLASS-REINFORCED GYPSUM FABRICATION MATERIALS

- A. Glass-Reinforced Gypsum Fabrications: ASTM C 1355/C 1355M.
- B. Embedments: As standard with glass-reinforced gypsum fabrication manufacturer and as required for reinforcement and for anchorage to substrates and framing.

2.3 AUXILIARY MATERIALS

- A. Adhesives: As recommended in manufacturer's written instructions.
- B. Steel Drill Screws: Provide fasteners, complying with the following requirements, that are of sufficient length and size to securely fasten gypsum-reinforced fabrications to framing members:
 - 1. Screws complying with ASTM C 1002 for fastening glass-reinforced gypsum fabrications to steel members less than 0.033 inch thick.
 - 2. Screws complying with ASTM C 954 for fastening glass-reinforced gypsum fabrications to steel members from 0.033 to 0.112 inch thick.
- C. Joint Treatment Materials: Provide materials complying with ASTM C 475 and with the recommendations of the manufacturers of both glass-reinforced gypsum fabrications and joint treatment materials for each application indicated.

2.4 FABRICATION

- A. Fabricate glass-reinforced gypsum units from molds constructed of rigid materials that will result in smooth-finished surfaces conforming to profiles, dimensions, and tolerances indicated. Provide units as large as practical to minimize joints.
- B. Remove units from molds and repair hollows, voids, scratches, and other surface imperfections.
- C. Material Compatibility: Fabricate glass-reinforced gypsum fabrications with surface characteristics required for a high-gloss paint finish.
- D. Embedments: Incorporate embedments so they develop the full strength of glass-reinforced gypsum fabrications. Cover embedments with glass-reinforced gypsum composite not less than 3/16 inch thick.
- E. Connection Hardware: Where required, custom designed and fabricated to support and connect glass-reinforced gypsum fabrications to hangers, support framing, and substrates.
- F. Dimensional Tolerances of Units: As follows:
 - 1. Factory-Finished Edge Straightness: Plus or minus 1/8 inch.
 - 2. Plane Surface Straightness: Plus or minus 1.8 inch.
 - 3. Overall Assembled Length and Width: Plus or minus 1/8 inch per 10 feet.
 - 4. Chords, Radii, and Diameters: Plus or minus 1/8 inch.
 - 5. Squareness: Not more than 1/4-inch difference between diagonals in 16 sq. ft.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for environmental conditions, installation tolerances, and other conditions affecting performance of glass-reinforced gypsum fabrications.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 GLASS-REINFORCED GYPSUM FABRICATION INSTALLATION

- A. Comply with ASTM C1467/C1467M.
- B. Install glass-reinforced gypsum fabrications level, plumb, true, and aligned with adjacent materials. Use concealed shims where required for alignment.
- C. Pre-drill fastener holes in glass-reinforced gypsum fabrications. Clean fastener holes to remove dirt and oil.
- D. Attach glass-reinforced gypsum fabrications to framing and substrates with steel drill screws. Do not use pneumatic staple guns. Countersink screw heads below adjoining finished surface.
- E. Fasten as required to comply with dimensional tolerances and not less than 5/16 inch from edge to end.
- F. Cover screw heads with joint compound to produce flush, smooth, and level finished surfaces.
- G. Attach glass-reinforced gypsum fabrications at joints with adhesive, and band or brace together until adhesive is cured. Cure adhesive according to glass-reinforced gypsum fabrication manufacturer's written instructions.

- H. Use joint-treatment materials to finish glass-fiber-reinforced plaster fabrications to produce surfaces ready to receive primers and paint finishes specified in Section 099123 "Interior Painting."
1. Finish joints between units, other than control joints, and countersunk fastener heads to comply with ASTM C 840 for Level 5 and to match surface texture of units.
 2. Repair hollows, voids, scratches, and other surface imperfections on units.

3.3 ERECTION AND LOCATION TOLERANCES

- A. Erection Tolerances: Install glass-reinforced gypsum fabrications so each unit complies with the following dimensional requirements:
1. Plane Alignment (Panel to Panel): 1/16 inch.
 2. Variation from Plumb: Plus or minus 1/8 inch per 10 feet.
 3. Variation from Straightness: Plus or minus 1/4 inch per 25 feet.
 4. Assembly Deflection: Not greater than the length of the assembly divided by 240.
 5. Joint Alignment: Not more than 1/8 inch.
 6. Joint Width: Not more than 3/8 inch.

END OF SECTION 092713

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Interior gypsum board.
 2. Exterior gypsum board for ceilings and soffits.
 3. Tile backing panels.

1.2 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.

1.3 QUALITY ASSURANCE

- A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
1. Build mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 3. Simulate finished lighting conditions for review of mockups.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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 instructions, 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, 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.

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.

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 the following:
 1. CertainTeed Corp.
 2. Georgia-Pacific Gypsum LLC.
 3. National Gypsum Company.
 4. USG Corporation.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
 3. Locations: From 6-inches above ceiling to deck. Provide impact-resistant gypsum board to 6-inches above ceiling.
- C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 1. Thickness: 1/2 inch.
 2. Long Edges: Tapered.
- D. Abuse-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.
 1. Core: 5/8 inch, Type X.
 2. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
 3. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
 4. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
 5. Long Edges: Tapered.
 6. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- E. Impact-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.
 1. Core: 5/8 inch, Type X.
 2. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
 3. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
 4. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
 5. Hard-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements according to test in Annex A1.

6. Long Edges: Tapered.
7. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
8. Locations: Provide from finish floor too 6-inches above ceiling.

F. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
4. Locations: Toilet rooms and where indicated.

2.4 TILE BACKING PANELS

A. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corp.
 - b. Georgia-Pacific Gypsum LLC.
 - c. USG Corporation.
2. Core: 5/8 inch, Type X.

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. Bullnose bead.
 - c. Expansion (control) joint.
 - d. 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: Corrosion-resistant primer compatible with joint compound and finish materials specified.

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. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 5. 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 Exterior Applications:
1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
- E. Joint Compound for Tile Backing Panels:
1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical 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.
- F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

- 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. 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. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. 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. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: Vertical surfaces unless otherwise indicated.
 - 2. Type X: Where required for fire-resistance-rated assembly.

3. Ceiling Type: Ceiling surfaces.
4. Abuse-Resistant Type: As indicated on Drawings.
5. Mold-Resistant Type: As indicated on Drawings.

B. 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-shaped 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.

C. 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-shaped 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.

- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

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 indicated on Drawings and as approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. Bullnose Bead: Use where indicated.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.
5. U-Bead: Use at exposed panel edges.

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

E. 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 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 3: Where indicated on Drawings.
 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

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 092900

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SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Quarry tile.
 2. Porcelain tile.
 3. Glazed wall tile.
 4. Stone thresholds.
 5. Tile backing panels.
 6. Waterproof membrane.
 7. Crack isolation membrane.
 8. Metal edge strips.

1.2 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 and ANSI A137.3 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 and ANSI A108.19, which are contained in its "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.

1.3 PERFORMANCE REQUIREMENTS

- A. Dynamic Coefficient of Friction: For tile installed on walkway surfaces, provide products that meet the requirements of ANSI A 137.1-2012 testing method, the DCOF AcuTest.
1. Minimum Threshold: 0.42 for level interior spaces expected to be walked upon when wet.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Verification:
1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.

3. Full-size units of each type of trim and accessory for each color and finish required.
4. Stone thresholds in 6-inch lengths.
5. Metal edge strips in 6-inch lengths.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of product.
- C. Product Test Reports: For tile-setting and -grouting products.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as 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.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Experienced firm with a record of at least five projects within the last three years successful in-service application similar in design and extent for that proposed for this project.

1.8 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 or ANSI A137.3 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.

1.9 FIELD 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 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 waterproof membrane and 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. Waterproof membrane.
 2. Crack isolation membrane.
 3. Cementitious backer units.
 4. Metal edge strips.

2.2 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. 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 TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. 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.

2.3 TILE PRODUCTS

- A. Ceramic Tile Type (QTF-1): Unglazed square-edged quarry tile.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design indicated on the Finish Legend on Drawings or a comparable product by one of the following:
 - a. Daltile (Basis-of-Design).
 - b. American Olean.
 - c. Florida Tile.
 - d. Summitville Quarry Tile.
 2. Face Size: As indicated on Interior Finishes Legend on Drawings.
 3. Thickness: 1/2 inch.
 4. Wearing Surface: Abrasive aggregate embedded in surface.
 5. Dynamic Coefficient of Friction: Not less than 0.42.
 6. Finish: Mat, clear glaze.
 7. Tile Color and Pattern: As indicated on Interior Finishes Legend on Drawings.
 8. Grout Color: As selected by Architect from manufacturer's full range.
 9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:

-
- a. Base (QTB-1): Coved, face size 8 by 5 inches.
- B. Ceramic Tile Type (PTF-1): Glazed porcelain tile.
1. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design indicated on the Finishes Legend on Drawings or a comparable product by one of the following:
 - a. Portobello America (Basis-of-Design).
 - 1) Product: Cement Block.
 - b. Architessa.
 - c. Crossville Tile.
 - d. Daltile.
 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
 3. Face Size: As indicated on Interior Finishes Legend on Drawings.
 4. Face Size Variation: Rectified.
 5. Thickness: 8.5 mm.
 6. Face: Plain with square edges.
 7. Dynamic Coefficient of Friction: Not less than 0.42.
 8. Tile Color, Glaze, and Pattern: As indicated on Finishes Legend on Drawings.
 9. Grout Color: As indicated on Finishes Legend on Drawings.
 10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base (PTB-1): Coved, face size as indicated on Interior Finishes Legend on Drawings.
- C. Ceramic Tile Type (CTW-2 to CTW-7): Glazed wall tile.
1. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design indicated on the Finish Legend on Drawings or a comparable product by one of the following:
 - a. Mosa Tile (Basis-of-Design).
 - b. Best Tile; Cinca.
 - c. Crossville Tile.
 - d. Daltile.
 2. Module Size: As indicated on Interior Finishes Legend on Drawings.
 3. Face Size Variation: Rectified.
 4. Thickness: 0.22 inch.
 5. Face: Plain with modified square edges.
 6. Finish: Plain gloss glaze.
 7. Tile Color and Pattern: As indicated on Finishes Legend on Drawings.
 8. Grout Color: As indicated on Finishes Legend on Drawings.
- 2.4 THRESHOLDS
- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503/C 503M, with a minimum abrasion resistance of 10 according to ASTM C 1353 or ASTM C 241/C 241M and with honed finish.
1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C-Cure.
 - b. Custom Building Products.
 - c. Georgia-Pacific Gypsum LLC.
 - d. USG Corporation.
 2. Thickness: 5/8 inch.

2.6 WATERPROOFING AND CRACK ISOLATION MEMBRANES

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10/ANSI A118.12 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 400.
 - d. TEC: H.B. Fuller Construction Products Inc.; HydraFlex Waterproof-Crack Isolation Membrane with TEC Waterproofing Mesh.
 - e. Southern Grouts & Mortars, Inc.; Southcrete 1100 Crack Suppression.
 - f. Summitville Tiles, Inc.; S-9000.
- C. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ARDEX Americas; ARDEX S 1-K One Component Waterproofing Compound.
 - b. C-Cure; Pro-Red Waterproofing Membrane 963.
 - c. Custom Building Products; RedGard Waterproofing and Crack Prevention Membrane.
 - d. Laticrete International, Inc.; Laticrete Hydro Ban.
 - e. MAPEI Corporation; Mapelastic HPG.
 - f. TEC: H.B. Fuller Construction Products Inc.; HydraFlex Waterproofing Crack Isolation Membrane.

2.7 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for high performance 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 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 Blue 92 Anti-Fracture Membrane.

- c. MAPEI Corporation; Mapelastic HPG with MAPEI Fiberglass Mesh.
- d. Summitville Tiles, Inc.; S-9000 Fluid-Applied Membrane.
- e. TEC: H.B. Fuller Construction Products Inc.; Roll-On Crack Isolation Membrane (ROCI).

2.8 SETTING MATERIALS

- A. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Custom Building Products; Porcelain Tile Fortified.
 - b. Laticrete International Inc.; 254 Platinum.
 - c. MAPEI Corporation; Ultraflex 3.
 - d. TEC: H.B. Fuller Construction Products, Inc.; 3N1 Performance Mortar .
 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 3. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
 4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.15.

2.9 GROUT MATERIALS

- A. Water-Cleanable Epoxy Grout: ANSI A118.3.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MAPEI Corporation; Kerapoxy CQ (Basis-of-Design).
 - b. Bostik, Inc.; EzPoxy.
 - c. Custom Building Products; CEG Lite.
 - d. Laticrete International, Inc.; Spectralock Pro Premium.
 - e. TEC: H.B. Fuller Construction Products Inc.; Accucolor EFX.
 2. 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.

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.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ARDEX Liquid BackerBoard Self-Leveling Underlayment.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. TEC: H.B. Fuller Construction Products, Inc.; Fast Set Deep Patch Leveler.
- B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Blanke Corporation.
 - b. Ceramic Tool Company, Inc.
 - c. Schluter Systems L.P. (Basis-of-Design).
 - 1) Products: Profiles and locations indicated on Drawings.

- C. 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.
- D. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Custom Building Products; Grout and Tile Sealer.
 - b. Laticrete International, Inc.; Bulletproof Sealer.
 - c. MAPEI Corporation; Penetrating Stone, Tile & Grout Sealer.
 - d. Summitville Tile, Inc.; SL-15 Invisible Seal.

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 the Work.
 - 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.
 - 2. Verify that concrete substrates for tile floors installed with adhesives bonded mortar bed or thinset 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. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/8 inch per foot toward drains.

- C. 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.

3.3 TILE BACKING PANEL INSTALLATION

- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.4 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA 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 TCNA 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 in laundries.
 - c. Tile floors consisting of tiles 8 by 8 inches or larger.
 - d. Tile floors consisting of rib-backed tiles.
- B. 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.
- C. 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.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. 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.
- G. Joint Widths: Unless otherwise indicated, install tile with the joint widths the narrowest joint recommended in writing by tile manufacturer.
- 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 on approved Shop Drawings. Form full depth joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles. Provide expansion joints as follows:
1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them and of equal or greater widths.
 2. Where tilework abuts restraining surfaces such as perimeter walls, curbs, columns, and ceilings.
 3. Where there is a change in substrate material.
 4. Interior Tilework: 20 to 25 feet in each direction.
 5. Above ground concrete substrates: 8 to 12 feet in each direction.
 6. Interior tilework exposed to direct sunlight: 8 to 12 feet in each direction.
 7. Interior tilework exposed to moisture: 8 to 12 feet in each direction.
- J. Relocated Movement Joints: Where tile joints do not align with substrate joints or existing in-plane substrate cracks, offset soft joints over crack isolation membrane in accordance with TCNA Method F125-Partial-15.
1. Minimum width of crack suppression membrane: Three times the width of tile adjacent to substrate crack or joint, such that tile on either side of joint is fully supported on membrane.
- K. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in improved modified dry-set mortar (thinset).
 2. Do not extend waterproofing or crack isolation membrane under thresholds set in improved modified dry-set mortar. Fill joints between such thresholds and adjoining tile set on waterproofing or crack isolation membrane with elastomeric sealant.
- L. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile and where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
- M. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.5 WATERPROOFING INSTALLATION

- A. Install waterproofing at all wet areas indicated to receive tile and to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.6 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 that is bonded securely to substrate.
- B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.7 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.8 PROTECTION

- A. 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.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.9 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Ceramic Tile Installation: TCNA F114 and ANSI A108.1B; cement mortar bed (thickset) with cleavage membrane; epoxy grout.
 - a. Ceramic Tile Type: Quarry tile.
 - b. Bond Coat for Cured-Bed Method: Improved modified dry-set mortar.
 - c. Grout: Water-cleanable epoxy grout.
 - 2. Ceramic Tile Installation: TCNA F115; thinset mortar; epoxy grout.
 - a. Ceramic Tile Type: Porcelain floor tile.
 - b. Thinset Mortar: Improved modified dry-set mortar.
 - c. Grout: Water-cleanable epoxy grout.
 - 3. Ceramic Tile Installation: TCNA F125-Full; thinset mortar on crack isolation membrane.
 - a. Ceramic Tile Type: Porcelain floor tile.
 - b. Thinset Mortar: Improved modified dry-set mortar.
 - c. Grout: Water-cleanable epoxy grout.
- B. Interior Wall Installations, Masonry or Concrete:
 - 1. Ceramic Tile Installation: TCNA W202; thinset mortar.
 - a. Ceramic Tile Type: Ceramic wall tile and tile base.
 - b. Thinset Mortar: Improved modified dry-set mortar.
 - c. Grout: Water-cleanable epoxy grout.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical panels.
2. Acoustical canopies.
3. Metal suspension system.
4. Metal edge moldings and trim.

- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Acoustical panels.
2. Metal suspension system.
3. Metal edge moldings and trim.

- B. Delegated Design Submittals: For seismic restraints for ceiling systems.

1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 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. Ceiling suspension-system members.
2. Structural members to which suspension systems will be attached.
3. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
5. Size and location of initial access modules for acoustical panels.
6. Items penetrating finished ceiling and ceiling-mounted items including the following:
 - a. Lighting fixtures.
 - b. Diffusers.
 - c. Grilles.
 - d. Speakers.
 - e. Sprinklers.

- f. Access panels.
- g. Perimeter moldings.

- B. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 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. Acoustical Ceiling Units: 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.
 - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site 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.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Source Limitations for Ceiling System: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for ceiling systems.
- B. Seismic Performance: Suspended ceilings to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
- C. 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: Class A in accordance with ASTM E1264.
 - 2. Smoke-Developed Index: 25 or less.
- D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL or from the listings of another qualified testing agency.

2.3 MANUFACTURERS

- A. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design products indicated or comparable products by one of the following:
 - 1. USG Corporation (Basis-of-Design).
 - 2. Armstrong World Industries.
 - 3. CertainTeed Corporation.
 - 4. Rockfon LLC.

2.4 ACOUSTICAL PANELS (ACT-1)

- A. Basis-of-Design Product: USG; Mars High NRC 86100.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels in accordance with ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows:
 - 1. Type and Form, Type IV Form 1 and 2: Mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face.
 - 2. Pattern: E (lightly textured) G (smooth) and as indicated by manufacturer's designation.
- D. Color: White.
- E. Light Reflectance (LR): Not less than 0.90.
- F. Ceiling Attenuation Class (CAC): Not less than 35.
- G. Noise Reduction Coefficient (NRC): Not less than 0.80.
- H. Edge/Joint Detail: Square.
- I. Thickness:
 - 1. 7/8 inch.

- J. Modular Size: 24 by 24 inches.
- K. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested in accordance with ASTM D3273, ASTM D3274, or ASTM G21 and evaluated in accordance with ASTM D3274 or ASTM G21.
- L. Suspension System: USG; DX.

2.5 ACOUSTICAL PANELS (ACT-2)

- A. Basis-of-Design Product: USG; Orion 75; 62150.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels in accordance with ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows:
 - 1. Type and Form, Type IV Form 2: Mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face and back.
 - 2. Pattern: E (lightly textured) G (smooth) and as indicated by manufacturer's designation.
- D. Color: White.
- E. Light Reflectance (LR): Not less than 0.87.
- F. Ceiling Attenuation Class (CAC): Not less than 24.
- G. Noise Reduction Coefficient (NRC): Not less than 0.75.
- H. Edge/Joint Detail: Square.
- I. Thickness:
 - 1. 5/8 inch.
- J. Modular Size: 24 by 24 inches.
- K. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested in accordance with ASTM D3273, ASTM D3274, or ASTM G21 and evaluated in accordance with ASTM D3274 or ASTM G21.
- L. Suspension System: USG; DX

2.6 ACOUSTICAL PANELS (ACT-3)

- A. Basis-of-Design Product: USG; Kitchen Lay-In Panel; 3210.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels in accordance with ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows:

1. Type and Form, Type IX Form 2: Mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face, back, and sealed edges.
 2. Pattern: G (smooth).
- D. Color: White.
- E. Light Reflectance (LR): Not less than 0.90.
- F. Ceiling Attenuation Class (CAC): Not less than 35.
- G. Edge/Joint Detail: Square.
- H. Thickness:
1. 5/8 inch.
- I. Modular Size: 24 by 24 inches.
- J. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested in accordance with ASTM D3273, ASTM D3274, or ASTM G21 and evaluated in accordance with ASTM D3274 or ASTM G21.
- K. Suspension System: USG; DX.
- 2.7 ACOUSTICAL PANELS (ACT-4)
- A. Basis-of-Design Product: USG; Frost 418.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels in accordance with ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows:
1. Type and Form, Type III: Mineral base with painted finish; Form 4, cast or molded.
 2. Pattern: E (lightly textured).
- D. Color: White.
- E. Light Reflectance (LR): Not less than 0.84.
- F. Ceiling Attenuation Class (CAC): Not less than 38/40.
- G. Noise Reduction Coefficient (NRC): Not less than 0.70.
- H. Edge/Joint Detail: As indicated by manufacturer's designation.
- I. Thickness:
1. 3/4 inch.
- J. Modular Size: 24 by 24 inches.
- K. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or

bacterial growth when tested in accordance with ASTM D3273, ASTM D3274, or ASTM G21 and evaluated in accordance with ASTM D3274 or ASTM G21.

- L. Suspension System: USG; DXT.

2.8 ACOUSTICAL CANOPIES (ACP-1 and ACP-2)

- A. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design products indicated or comparable products by one of the following:
 - 1. Armstrong World Industries (Basis-of-Design).
 - a. Product: Soundscapes Acoustical Canopies.
 - 2. CertainTeed Corporation.
 - 3. Rockfon LLC.
 - 4. USG Corporation.
- B. Profiles and Sizes: As indicated on Drawings.
- C. Mounting: Provide manufacturer's Canopies Suspension Kit.

2.9 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Ceilings.
 - 3. Rockfon.
 - 4. USG Corporation.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories in accordance with ASTM C635/C635M and designated by type, structural classification, and finish indicated.
 - 1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" in accordance with ASTM C635/C635M.
- 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) or butt-edge type.
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: Cold-rolled steel.
 - 5. Cap Finish: Painted white.

2.10 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.

2. Stainless Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.
3. Nickel-Copper-Alloy Wire: ASTM B164, nickel-copper-alloy UNS No. N04400.
4. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.

- C. Hold-Down Clips: Manufacturer's standard hold-down.
- D. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.
- E. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

2.11 METAL EDGE MOLDINGS AND TRIM

- A. Products: Subject to compliance with requirements, provide one of the following:
 1. Armstrong World Industries, Inc.
 2. CertainTeed Corporation.
 3. Fry Reglet Corporation.
 4. Gordon, Inc.
 5. Rockfon (Rockwool International).
 6. USG Corporation.
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 1. Edge moldings to fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.12 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 for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), 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.

2.13 AUXILIARY MATERIALS

- A. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

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 unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION OF ACOUSTICAL PANEL CEILINGS

- A. Install acoustical panel ceilings in accordance with ASTM C636/C636M, seismic design requirements, and manufacturer's written instructions.
 - 1. Fire-Rated Assembly: Install fire-rated ceiling systems in accordance with 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 to structure 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.
- 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. 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 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. Install hold-down and seismic clips in areas indicated; space in accordance with panel manufacturer's written instructions unless otherwise indicated.
 - a. Hold-Down Clips: Space 24 inches o.c. on all cross runners.
 6. Protect lighting fixtures and air ducts in accordance with requirements indicated for fire-resistance-rated assembly.
- 3.4 ERECTION TOLERANCES
- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 - 1. Periodic inspection during the installation of suspended ceiling grids in accordance with ASCE/SEI 7.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no panels have been installed. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.
 - 1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
 - 2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 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.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 095426 - SUSPENDED WOOD CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood-veneer, linear-plank ceilings.

1.2 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.

1.3 COORDINATION

- A. Coordinate layout and installation of wood ceilings and suspension systems with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Wood-veneer, linear-plank ceilings.

B. Shop Drawings: For suspended wood ceilings.

1. Include reflected ceiling plans, sections, and details, drawn to scale, showing the following:
 - a. Wood ceiling patterns and joints.
 - b. Ceiling suspension members.
 - c. Method of attaching hangers to building structure and locations of cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - d. Ceiling-mounted items including, but not limited to, light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
 - e. Ceiling perimeter and penetrations through ceiling; trim and moldings.

C. Samples for Verification: For the following products:

1. Wood Ceilings: 12-inch- long by 12-inch- wide or full-width Samples of each type, color, and finish.
2. Suspension-System Members: 12-inch- long Sample of each type.
3. Exposed Molding and Trim: 12-inch- long Samples of each type, color, and finish.
4. Filler Strips: 12-inch- long Samples of each type, color, and finish.

D. Delegated Design Submittals: For design of seismic restraints and attachment devices.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Product Test Reports: For each suspended wood ceiling, for tests performed by a qualified testing agency.

- C. Evaluation Reports: For suspended-wood-ceiling framing systems.
- D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes 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. Suspended-Wood-Ceiling Components: Quantity of each wood-ceiling unit, suspension-system component, accessory, and exposed molding and trim equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by National Voluntary Laboratory Accreditation Program for testing indicated.
- 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 suspended wood ceiling as shown on Drawings.
 - a. Demonstrate treatment of exposed field cuts.
 - 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. Deliver ceiling components and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
 - 1. Store materials flat and level, raised from the floor.
- B. Handle ceiling components and accessories in a manner that prevents damage.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install interior ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
 - 1. Store and acclimatize wood products in the spaces where they will be installed for a minimum of 72 hours immediately before ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements" to design seismic restraints and attachment devices.
- B. Structural Performance: Exterior suspended wood ceilings to withstand exterior exposure, the effects of gravity loads, and the following loads and stresses without showing permanent deformation of ceiling system components or permanent damage to fasteners and anchors:
 - 1. Wind Load: Uniform pressure indicated on Drawings, acting inward or outward.
- C. Seismic Criteria: Provide suspended wood ceilings designed and installed to withstand the effects of earthquake motions in accordance with ASCE/SEI 7 and requirements of authorities having jurisdiction.

2.2 WOOD-VENEER, LINEAR-PLANK CEILINGS (WCP-1)

- A. Wood-Veneer Linear Ceiling Planks: Manufacturer's standard planks consisting of wood veneer adhered to backs and exposed surfaces of manufacturer's standard composite-wood cores; with square-cut ends.
 - 1. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - a. Rulon International.
 - 1) Product: Linear Open.
 - b. Armstrong World Industries, Inc. - Ceilings.
 - c. ASI Architectural.
 - d. CertainTeed Corp., Ceilings.
 - e. Hunter Douglas Contract.
 - f. USG Corporation.
 - 2. Surface-Burning Characteristics: Provide products with the following characteristics when tested in accordance with ASTM E84:
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 50 or less.
 - 3. Veneer Face Grade: Manufacturer's standard.
 - 4. Veneer Species: As indicated on Interior Finishes Legend on Drawings.
 - 5. Veneer Cut: Manufacturer's standard.
 - 6. Nominal Plank Width: As indicated on Interior Finishes Legend on Drawings.
 - 7. Plank Depth: 3/4 inch.
 - 8. Plank Length: Random lengths; varying from 3 to 10 feet.
 - 9. Plank Long Edge: Square.
 - a. Reveal/Plank Spacing: 3/4 inch between long edges of planks.
 - b. Reveal Filler Strip: Black felt.
 - 10. Plank End Joints: Tongue and groove.
 - 11. Veneer Adhesive: Manufacturer's standard that complies with requirements in "Performance Requirements" Article.
 - 12. Factory Finish: Manufacturer's standard finish; applied on every wood surface.
 - a. Type: Clear.

- B. Linear-Ceiling-Plank Accessories: Linear-ceiling-plank manufacturer's accessories required to provide a complete installation of ceiling in accordance with manufacturer's written installation instructions.
1. Attachment Clips: Manufacturer's standard metal clips for attaching planks to suspension system.
 2. Plank Leveling Splines: Manufacturer's standard for aligning ends of planks.
 3. Plank Splice Plates: Manufacturer's standard.
 4. Veneer Edge Banding: Manufacturer's standard matching planks for treating cut edges; with pressure-sensitive adhesive backing.
- C. Grid Suspension System: ASTM C635/C635M; recommended in writing by ceiling and suspension-system manufacturers for applications indicated; main- and cross-runner system complete with suspension-system components required to support ceiling units and other ceiling-supported construction.
1. Material: ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 coating designation.
 2. Structural Classification: Heavy-duty system.
 3. Face Width: 15/16 inch.
 4. Finish: Flat black.
- D. Linear-Carrier Suspension System: ASTM C635/C635M and recommended in writing by ceiling and suspension-system manufacturer for applications indicated; complete with factory-applied linear clips spaced to match plank modules, splice sections, stabilizer, and suspension-system components required to support ceiling units and other ceiling-supported construction.
1. Material: ASTM A653/A653M, hot-dipped galvanized, cold-rolled sheet steel, G60 coating designation.
 2. Structural Classification: Heavy-duty system.
 3. Carrier Splices: Same metal, profile, and finish as for carriers.
 4. Stabilizer Channels, Tees, and Bars: Manufacturer's standard components for stabilizing main carriers.
 5. Finish: Flat black.

2.3 SUSPENSION-SYSTEM HANGERS, BRACES, AND TIES

- A. Attachment Devices: Size for 5 times the design load indicated in ASTM C635/C635M, Table 1, Direct Hung, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which suspended wood 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 suspended wood ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of suspended wood ceilings.
1. Balance border widths at opposite edges of each ceiling.
 2. Avoid using less-than-half-width units.

3.3 INSTALLATION OF SUSPENDED WOOD CEILINGS

- A. Comply with ASTM C636/C636M and seismic requirement indicated, in accordance with manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- 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 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 in 3 inches. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate to which hangers are attached and for type of hanger involved.
 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts or postinstalled mechanical or adhesive anchors that extend through forms into concrete.
 6. 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.
 7. Do not attach hangers to steel deck tabs.
 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 9. 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.
 10. 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 in 1-1/2 inches. Suspend bracing from building's structural members as required for hangers and 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 at perimeter of ceiling area and where necessary to conceal edges and ends of wood units.
1. Screw-attach metal moldings to substrate at intervals of 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.
 2. Do not use exposed fasteners on moldings and trim.
- E. Grid Suspension Systems: Space main beams at 48 inches o.c.
1. Install cross tees to form modules sized in accordance with manufacturer's written installation instructions.
 2. Remove and replace dented, bent, or kinked members.
- F. Install wood components and accessories in accordance with manufacturer's written instructions and to accommodate natural expansion and contraction of wood products resulting from fluctuations in humidity.
- G. Cut wood components for accurate fit at borders and at interruptions and penetrations by other work through ceilings.

1. Stiffen edges of cut wood components as required to eliminate variations in flatness.
- H. Treat field-cut edges of wood components in accordance with manufacturer's written recommendations; finish exposed field cuts to match factory finish.
 1. Wood-Veneer Units: Edge band exposed field-cut edges.
- I. Install wood components in coordination with suspension system and moldings and trim.
 1. Install wood components in patterns indicated on Drawings.
- J. Install field-constructed access panels in locations indicated on Drawings.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 1. Suspended ceiling system.
 2. Hangers, anchors, and fasteners.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Tests and Inspections: Testing and inspecting of completed installations of ceiling hangers, anchors, and fasteners to take place in successive stages, in test areas and using methods as follows. Do not proceed with installations of ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
 1. Test Areas: Test installation of ceiling suspension systems on each floor when installation has reached 20 percent completion but before wood ceilings have been installed.
 - a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
 - b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.5 CLEANING

- A. Clean exposed surfaces of ceilings, including trim and edge moldings. 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, including dented units.

END OF SECTION 095426

SECTION 096400 - WOOD STAGE FLOORING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes field-finished wood stage-floor assemblies.

1.2 SYSTEMS DESCRIPTION

- A. Provide monolithically rigid, slightly sprung, wood stage floor suited for multi-use performances.
- B. The system consist of two layers of subflooring installed on resilient pads with finish surface of tempered hardboard at performance area and hardwood strip flooring at forestage.

1.3 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood stage-floor assemblies.
- B. Shop Drawings: Show installation details including location and layout of each type of floor assembly and accessory. Include the following:
 - 1. Expansion provisions and trim details.
- C. Samples for Verification: For each type of stage-floor assembly and accessory required; approximately 12 inches long and of same thickness and material indicated for the Work. For hardwood strip flooring, provide sample approximately 12 inches long, showing the full range of normal color and texture variations expected and stained and finished as proposed for this Project.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wood stage-floor assemblies and finish systems to include in maintenance manuals. Include the following:
 - 1. Overview of floor construction, including its inherent features.
 - 2. Recommended practices and accessories (“improved stage screws”) for fastening and anchoring scenic and production elements to the floor and repair of the floor after removal of screws.
 - 3. Recommendations for routine cleaning and maintenance.
 - 4. Recommendations for appropriate paints for re-application.
 - 5. Instructions for the removal and replacement of the top hardboard layer when it becomes too damaged by production wear and tear to be repaired.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed wood stage-floor assembly installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in installations with a record of successful in-service performance.

1. Installer responsibilities include installation and field finishing of stage-floor assembly components and accessories.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver assembly materials in unopened cartons or bundles.
- B. Protect wood from exposure to moisture. Do not deliver wood components until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.
- C. Store wood components in a dry, warm, well-ventilated, weathertight location and in a horizontal position. Do not store in contact with masonry.

1.8 PROJECT CONDITIONS

- A. Conditioning period begins not less than seven days before stage-floor assembly installation, is continuous through installation, and continues not less than seven days after stage-floor installation.
 1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants, but not less than 35 percent or more than 50 percent, in spaces to receive stage-floor assemblies during the conditioning period.
 2. Wood Conditioning: Move wood components into spaces where they will be installed, no later than beginning of the conditioning period.
 - a. Do not install stage-floor assemblies until wood components adjust to relative humidity of, and are at same temperature as, spaces where they are to be installed.
 - b. Open sealed packages to allow wood components to acclimatize immediately on moving wood components into spaces in which they will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install stage-floor assemblies after other finishing operations, including painting, except for painting of stage floor itself, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Resilient Pads: Subject to compliance with requirements, provide products by one of the following:
 1. Kenetics.
 2. Mason Industries.
- B. Tempered High Density Fiberboard:
 1. Subject to compliance with requirements, provide the following or approved substitute:
 - a. Masonite "Duron" tempered floor underlayment.

2.2 WOOD PANEL PRODUCTS, GENERAL

- A. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.

- B. Oriented Strand Board: DOC PS 2.
- C. Factory mark panels to indicate compliance with applicable standard.

2.3 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA U1, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
 - 1. 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 concealed wood members in contact with masonry or concrete.

2.4 WOOD STAGE FLOORING

- A. Solid-Wood, Strip Flooring (WSF-1): Kiln dried to 6 to 9 percent maximum moisture content, tongue and groove and end matched, and with backs channeled (kerfed) for stress relief.
 - 1. Species: Northern hard maple.
 - 2. Cut: Plain sawn.
 - 3. Thickness and Face Width: 3/4-inch thick by 2-1/4-inch wide.
 - 4. Lengths: Random-length strips complying with applicable grading rules.
 - 5. Backs: Channeled (kerfed) for stress relief.
 - 6. Stage Treads and Risers: Wood to match stage flooring.
- B. Urethane Finish System: Complete water-based system of compatible components, complying with VOC limitations, that is recommended by finish manufacturer for application indicated.
 - 1. Floor Sealer: Pliable, penetrating type.
 - a. BonaKemi USA Inc.; Bonaseal or approved substitute.
 - 2. Finish Coats: Formulated for multicoat application on wood flooring.
 - a. BonaKemi USA Inc.; Bonatech Traffic Commercial Finish, Satin, or approved substitute.
- C. Wood Filler: Compatible with finish system components and recommended by filler and finish manufacturers for use indicated. If required to match approved Samples, provide pigmented filler.

2.5 SUBFLOOR SYSTEM

- A. Oriented-Strand-Board Subflooring: Exposure 1 single-floor panels or sheathing.
 - 1. Span Rating: Not less than 16 o.c.
 - 2. Nominal Thickness: Not less than 23/32 inch.
- B. Plywood Underlayment: APA rated, A-C, exterior glue, tongue and groove, 23/32 inch thick.
- C. Resilient Pads:

1. Type: Ribbed or waffled.
2. Hardness: 50 durometer.
3. Material: Neoprene.
4. Thickness: 1/2 inch.

2.6 ACCESSORIES

- A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by stage-floor manufacturer.
- B. Vapor Retarder: ASTM D 4397, polyethylene sheet not less than 6 mils thick.
- C. Fasteners: Cement-coated steel staples, 1-1/2 inches long.
- D. Adhesive: Mastic recommended by flooring and adhesive manufacturers for application indicated.
- E. Sealant: complying with Section 079200 "Joint Sealants."
- F. Resilient Wall Base: Molded, vented, rubber or vinyl cove base; 4 inches high with a 3-inch coved toe. Manufacturer's standard length, not less than 48 inches. Provide premolded outside corners.
 1. Color: As selected by Architect from manufacturer's full range.
- G. Cork Expansion Strip: Composition cork strip.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of stage-floor assemblies.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Concrete Slabs: Verify that concrete slabs comply with requirements specified in Section 033000 "Cast-In-Place Concrete."
 1. 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. Perform additional moisture tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

- A. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.

1. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- B. Remove coatings including curing compounds and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone; use mechanical methods recommended by manufacturer. Do not use solvents.
- C. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Comply with flooring manufacturer's written installation instructions, but not less than applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."
- B. Pattern: Lay flooring parallel with long dimension of space to be floored, unless otherwise indicated.
- C. Expansion Spaces: Provide as indicated, but not less than that required by manufacturer's written instructions and MFMA's written recommendations at walls and other obstructions, and at interruptions and terminations of flooring.
 1. Cover expansion spaces with base molding, trim, and saddles, as indicated on Drawings.
- D. Vapor Retarder: Install with joints lapped a minimum of 6 inches and sealed. Turn up a minimum of 3 inches at perimeter.
- E. Resilient Pads: Install in accordance with manufacturer's written recommendations.
- F. Underlayment: Install perpendicular to direction of flooring, staggering end joints in adjacent rows.
- G. Finish Floor, Stage:
 1. Clean, dry and level subfloor.
 2. Install panels with staggered joints, with rows starting with one piece centered at the front edge of the stage floor.
 3. Provide 1/8-inch gap at each panel joint.
 4. Staple panels at center and at perimeter at 12 inches on center and 1/2-inch from edge.
 5. Staple panels at interruptions or penetrating items at 6-inches on center, with a minimum of two staples per side.
 6. Set staples flush with floor with no protruding edges
- H. Finish Floor, Forestage: Blind nail or staple flooring to substrate.
- I. Installation Tolerances: 1/8 inch in 10 feet of variance from level.
- J. Cover wood flooring before finishing.

3.4 SANDING AND FINISHING

- A. For finishing of forestage flooring, comply with applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."
- B. Allow installed flooring to acclimate to ambient conditions for at least 10 days before sanding.

- C. Fill and repair wood flooring seams and defects.
- D. Apply one coat of floor sealer in accordance with manufacturer's written recommendations.
- E. Mix Traffic finish and hardener in accordance with manufacturer's written recommendations.
- F. Apply three coats of floor-finish materials in accordance with manufacturer's written recommendations.
 - 1. Lightly sand or abrade between coat as recommended by manufacturer and vacuum and clean with tack cloth.
 - 2. For water-based finishes, use finishing methods recommended by finish manufacturer to minimize grain raise.

3.5 PROTECTION

- A. Protect stage floors during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.
 - 1. Do not cover stage floors after finishing until finish reaches full cure, and not before seven days after applying last finish coat.
 - 2. Do not move heavy and sharp objects directly over stage floors. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096400

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient molding accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 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.

1.4 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.

1.5 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 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
 - 1. Tarkett North America (Basis of Design).
 - a. Product: Johnsonite Baseworks.
 - 2. Burke Flooring.
 - 3. Flexco Company.

4. Nora Systems, Inc.
5. Roppe Corporation.

2.2 RESILIENT BASE (RBS-1)

- A. Resilient Base: Resilient Base Standard, ASTM F 1861.
 1. Material Requirement: Type TS (vulcanized thermoset rubber), Group I (solid, homogeneous).
 2. Style: Cove (base with toe).
 3. Minimum Thickness: 0.080 inch.
 4. Height: 4 inches.
 5. Lengths: Coils in lengths standard with manufacturer, but not less than 96 feet.
 6. Outside, Inside Corners: Job-formed.
 7. Colors: As indicated on Room Finish Legend.

2.3 RESILIENT MOLDING ACCESSORY

- A. Description: Carpet edge for glue-down applications, transition strips, reducer strip for resilient flooring.
- B. Material: Rubber.
- C. Profile and Dimensions: As selected by Architect.
- D. Colors: As selected by Architect from full range of industry colors.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products 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.
- 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 and form with returns not less than 3 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Miter corners to minimize open joints.

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. 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 096513

SECTION 096520 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vinyl composition floor tiles.

1.2 ALTERNATES

- A. The Work of this Section is affected by an Alternate. Refer to Section 012300 "Alternates."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
- C. Samples: Full-size units of each color and pattern required.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for floor tile including resilient base and accessories.
 - a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 deg F. Store tiles on flat surfaces.
- C. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.8 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive flooring.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Close spaces to traffic during flooring installation and for 48 hours after flooring installation.
- D. Install flooring after other finishing operations, including painting, have been completed.
- E. Do not install flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive, as determined by flooring manufacturer's recommended bond and moisture test.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Furnish not less than 1 box for each 1 of each type, color, pattern, class, wearing surface, and size of resilient tile flooring installed.
 - 2. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION FLOOR TILE (VCT-1 TO VCT-8)

- A. Vinyl Composition Floor Tile: Products complying with ASTM F 1066.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Room Finish Legend or comparable products by one of the following:
 - a. AHF; Armstrong Flooring (Basis-of-Design).
 - 1) Product: Standard Excelon Imperial Texture.
 - b. Mannington Commercial.
 - c. Tarkett North America.
 - 2. Description:
 - a. Class: Class 2 (through-pattern tile).
 - b. Wearing Surface: Smooth.
 - c. Thickness: 0.125 inch.
 - d. Size: 12 by 12 inches.
 - e. Color and Pattern: As indicated on Interior Finishes Legend on Drawings.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit flooring and substrate conditions indicated.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified.
- 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 flooring manufacturer.
 - 2. 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.
 - 3. 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.
 - 4. Subfloor finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" for slabs receiving resilient flooring.
 - 5. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with resilient product manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

- D. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 FLOOR INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tiles.
- B. Apply leveling compound at transitions from tile to resilient flooring and feather out over two feet.
- C. 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 square with room axis.
- D. 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 luxury vinyl tiles in pattern of colors indicated.
 2. Lay vinyl composition tiles with grain direction alternating in adjacent tiles (basket-weave pattern).
 3. At ramps, install tile so that joints do not occur at changes of plane in substrate.
- E. 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.
- F. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- G. 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.
- 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.
1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Hand roll resilient flooring according to manufacturer's written instructions.

3.4 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing resilient products:
1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.
 2. Sweep or vacuum floor thoroughly.
 3. Do not wash floor until after time period recommended by flooring manufacturer.
 4. Damp-mop floor to remove marks and soil.
- B. Protect flooring against mars, marks, indentations, and other 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 flooring manufacturer.

1. Apply protective floor polish to floor surfaces that are free from soil, visible adhesive, and surface blemishes, if recommended in writing by manufacturer.
 - a. Use commercially available product acceptable to flooring manufacturer.
 - b. Coordinate selection of floor polish with Owner's maintenance service.
 2. Cover products installed on floor surfaces with undyed, untreated building paper until inspection for Substantial Completion.
 3. Do not move heavy and sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- C. Clean floor surfaces not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations.
1. Before cleaning, strip protective floor polish that was applied after completing installation only if required to restore polish finish and if recommended by flooring manufacturer.
 2. After cleaning, reapply polish to floor surfaces to restore protective floor finish according to flooring manufacturer's written recommendations. Coordinate with Owner's maintenance program.

END OF SECTION 096520

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SECTION 096543 - LINOLEUM FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Linoleum sheet flooring.
2. Linoleum floor tile.

1.2 ALTERNATES

- A. The Work of this Section is affected by an Alternate. Refer to Section 012300 "Alternates."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: For each type of linoleum flooring.

1. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

- C. Samples for Verification: For each type of linoleum flooring, in manufacturer's standard size, but not less than 6-by-9-inch sections of each different color and pattern required.

1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

- D. Heat-Welded Seam Samples: For each linoleum flooring product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to rigid backing and prepared by Installer for this Project.

- E. Product Schedule: For linoleum flooring. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of linoleum flooring to include in maintenance manuals.

1.6 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. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

2. Sheet Flooring: Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, in roll form and in full roll width for each type, color, and pattern of sheet flooring installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for flooring installation and seaming methods indicated.
 1. Engage an installer who employs workers for this Project who are trained or certified by flooring manufacturer for installation techniques required.
- 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. Coordinate mockups in this Section with mockups specified in other Sections.
 - a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.
 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. Store flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 65 deg F or more than 90 deg F.
 1. Floor Tile: Store on flat surfaces.
 2. Sheet Flooring: Store rolls upright.

1.9 FIELD CONDITIONS

- A. Close spaces to traffic during flooring installation.
- B. Close spaces to traffic for 72 hours after flooring installation.
- C. Install flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For linoleum flooring, 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.

2.2 LINOLEUM SHEET FLOORING (LSF-1)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 1. Forbo Flooring (Basis-of-Design).

- a. Product: Marmoleum Composition Sheet (MCS).
 2. Gerflor USA.
 3. Tandus Inc.
- B. Linoleum Sheet Flooring: ASTM F2034, Type I, linoleum sheet with backing.
1. Roll Size: In manufacturer's standard length, but not less than 79 inches wide.
- C. Thickness: 0.080 inch.
- D. Heat-Welding Bead: For seamless installation, solid-strand product of linoleum flooring manufacturer.
1. Colors: Match linoleum flooring.
- E. Colors and Patterns: As indicated on Finish Legend on Drawings.
- 2.3 LINOLEUM FLOOR TILE (LTF-1 TO LTF-8)
- A. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
1. Forbo Flooring (Basis-of-Design).
 - a. Product: Marmoleum Composition Tile (MCT).
 2. Or equal product as approved by Architect.
- B. Linoleum Floor Tile: ASTM F2195, Type I, linoleum floor tile with fibrous backing.
1. Nominal Floor Tile Size: 13 by 13 inches.
- C. Thickness: 0.08 inch.
- D. Colors and Patterns: As indicated on Finish Legend on Drawings.
- 2.4 INSTALLATION MATERIALS
- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by linoleum flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by the Basis-of-Design linoleum manufacturers to suit products and substrate conditions indicated.
1. Basis-of-Design: Subject to compliance with requirements, provide products by the Basis-of-Design indicated or a comparable product by one of the following:
 - a. Forbo Flooring (Basis-of-Design).
 - b. Or equal product as approved by Architect.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by linoleum flooring manufacturer.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 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 flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to linoleum flooring manufacturer's written instructions to ensure adhesion of flooring.
- B. Concrete Substrates: Prepare according to 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 flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by linoleum flooring manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by linoleum flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing.
 - 4. Moisture Testing: Perform tests so that each test area does not exceed 1000 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; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install flooring until materials are the same temperature as space where they are to be installed.
 - 1. At least 72 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by flooring.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions for installing flooring.
- B. Scribe and cut flooring to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, thresholds, door frames, and nosings.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings.

- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- E. Install flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.
- F. Adhere flooring to 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.
- G. Heat-Welded Seams: For seamless installation, comply with ASTM F1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

3.4 LINOLEUM FLOOR TILE INSTALLATION

- A. Lay out linoleum 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 tile at perimeter.
 - 1. Lay floor tiles in pattern indicated.
- B. Match linoleum floor tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.
 - 1. Lay floor tiles with grain running in one direction.

3.5 LINOLEUM SHEET FLOORING INSTALLATION

- A. Unroll linoleum sheet flooring and allow it to stabilize before cutting and fitting.
- B. Lay out linoleum sheet flooring as follows:
 - 1. Maintain uniformity of flooring direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
 - 3. Match edges of flooring for color shading at seams.
 - 4. Avoid cross seams.
 - 5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).

3.6 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting linoleum flooring.
- B. Perform the following operations immediately after completing linoleum flooring installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect linoleum flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

- D. Floor Polish: Remove soil, adhesive, and blemishes from linoleum flooring surfaces before applying liquid floor polish.
 - 1. Apply number of coats as recommended in writing by manufacturer.

- E. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover linoleum flooring until Substantial Completion.

END OF SECTION 096543

SECTION 096566 - RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sheet vinyl flooring.

1.2 COORDINATION

- A. Coordinate layout and installation of flooring with floor inserts for gymnasium equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: Show installation details and locations of the following:

1. Floor patterns.
2. Layout, colors, widths, and dimensions of game lines and markers.
3. Locations of floor inserts for athletic equipment installed through flooring.
4. Seam locations for sheet flooring.

- C. Samples for Verification: For each type, color, and pattern of flooring specified, 6-inch- square in size and of same thickness and material indicated for the Work.

1. Game-Line- and Marker-Paint Samples: Include Sample sets showing game-line- and marker-paint colors applied to flooring.
2. Seam Samples: For each vinyl sheet flooring color and pattern required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For sheet vinyl flooring Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resilient athletic flooring to include in maintenance manuals.

1.6 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. Sheet Flooring: Furnish full-width rolls of not less than 10 linear feet for each 500 linear feet or fraction thereof, of each type, color, and pattern of flooring installed.

1.7 QUALITY ASSURANCE

- A. Sheet Vinyl Flooring Installer Qualifications: An experienced installer who has completed sheet vinyl flooring installations using seaming methods indicated for this Project and similar in material, design, and extent to that indicated for this Project; who is acceptable to manufacturer; and whose work has resulted in installations with a record of successful in-service performance.

1.8 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 storing.
- B. Store materials to prevent deterioration.
 - 1. Store tiles on flat surfaces.
 - 2. Store rolls upright.

1.9 FIELD CONDITIONS

- A. Adhesively Applied Products:
 - 1. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than 65 deg F or more than 95 deg F, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
 - 2. After postinstallation period, maintain temperatures within range recommended in writing by manufacturer, but not less than 65 deg F or more than 95 deg F.
 - 3. Close spaces to traffic during flooring installation.
 - 4. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.
- B. Install flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 SHEET VINYL FLOORING (RAF-1)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design product indicated or a comparable product by one of the following:
 - 1. Tarkett Sports Indoor (Basis-of-Design).
 - a. Product: Omnisports Multi-Use with Tarkolay.
 - 2. Action Floor Systems.
 - 3. Connor Sports Flooring.
 - 4. Mondo Flooring.
- B. Description: Sheet vinyl flooring specifically designed for adhered athletic flooring applications.
- C. Sheet Vinyl Flooring with Backing: ASTM F1303.
 - 1. Type (Binder Content): Type I, minimum binder content of 90 percent.
 - 2. Wear-Layer Thickness: Grade 1.
 - 3. Overall Thickness: 6.2 mm.

4. Interlayer Material: Foamed plastic.
 5. Backing Class: Class C (foamed plastic).
- D. Seaming Method: Heat welded.
- E. Traffic-Surface Texture: Smooth.
- F. Applied Finish: Factory-applied UV urethane.
- G. Roll Size: 6'-6" wide by longest length that is practical to minimize splicing during installation.
- H. Color and Pattern: As indicated on Finishes Legend on Drawings.

2.2 ACCESSORIES

- A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.
- B. Adhesives: Water-resistant type recommended in writing by manufacturer for substrate and conditions indicated.
- C. Game-Line and Marker Paint: Complete system including primer, if any, compatible with flooring and recommended in writing by flooring and paint manufacturers for use indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, 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 resilient products.
- B. 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 flooring.
- B. Concrete Substrates: Prepare according to ASTM F710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Alkalinity Testing: Perform pH testing according to ASTM F710. Proceed with installation only if pH readings are not less than 7.0 and not greater than 11.
 3. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 83 percent relative humidity level measurement.

- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.
 - 1. Do not install flooring until it is the same temperature as space where it is to be installed.
- F. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 FLOORING INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions.
- B. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on flooring. Use nonpermanent, nonstaining marking device.

3.4 SHEET FLOORING INSTALLATION

- A. Unroll sheet flooring and allow it to stabilize before cutting and fitting.
- B. Lay out sheet flooring as follows:
 - 1. Maintain uniformity of flooring direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
 - 3. Match edges of flooring for color shading at seams.
 - 4. Locate seams according to approved Shop Drawings.
- C. Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
 - 1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- D. Vinyl Sheet Flooring Seams: Prepare and finish seams to produce surfaces flush with adjoining flooring surfaces.
 - 1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and use welding bead to permanently fuse sections into a seamless flooring.

3.5 GAME LINES AND MARKERS

- A. Mask flooring at game lines and markers, and apply paint to produce sharp edges. Where crossing, break minor game line at intersection; do not overlap lines.
- B. Apply game lines and markers in widths and colors according to requirements indicated on Drawings.

3.6 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing flooring installation:
 - 1. Remove adhesive and other blemishes from flooring surfaces.
 - 2. Sweep and vacuum flooring thoroughly.
 - 3. Damp-mop flooring to remove marks and soil after time period recommended in writing by manufacturer.
- B. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096566

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SECTION 096623 - RESINOUS MATRIX TERRAZZO FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Thin-set, epoxy-resin terrazzo flooring and base.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work. Show layout of the following:
 - 1. Divider strips.
 - 2. Control-joint strips.
 - 3. Accessory strips.
 - 4. Abrasive strips.
 - 5. Terrazzo patterns.
- C. Samples for Verification: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes, and proportions. Prepare Samples of same thickness and from same material to be used for the Work, in size indicated below:
 - 1. Terrazzo: 6-inch- square Samples.
 - 2. Accessories: 6-inch- long Samples of each exposed strip item required.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
 - 1. Installer: Provide proof of NTMA membership, documentation of experience, and resumes of key personnel.
 - 2. Manufacturer: Provide proof of NTMA membership and written approval of installer.
- B. Material Certificates: For each type of terrazzo material or product, from manufacturer.
- C. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For terrazzo to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Engage an installer who is a contractor member of NTMA.
 - 2. Engage an installer who has at least 5 years of satisfactory experience in installation of epoxy-terrazzo flooring systems.

3. Furnish experience resumes of key personnel including supervisors and technicians to be utilized on Project, including project manager, field supervisor, head mechanic for placing and lead grinder.
 4. Furnish documentation of at least 3 epoxy-terrazzo projects of similar scope and using same material as specified for this project, that installer has installed during the past 5 years, including the following:
 - a. Project name.
 - b. Square footage of terrazzo installed.
 - c. Lineal footage of precast base and cast-in-place base.
 - d. Address of facility with contact name and phone number.
 - e. Contact name, address and phone number of general contractor or construction manager.
 - f. Field experience resumes of key project personnel including supervisors and technicians.
 5. Engage an installer who is certified in writing by terrazzo manufacturer as qualified to install manufacturer's products.
- B. Source Limitations: Obtain primary terrazzo materials from single source from single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
- C. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from single source with resources to provide materials of consistent quality in appearance and physical properties.
- D. NTMA Standard: Comply with NTMA Guide Specification and written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- E. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups for terrazzo including accessories.
 - a. Size: Minimum 100 sq. ft. of typical poured-in-place flooring and base condition for each color and pattern in locations directed by Architect.
 - b. Include base.
 2. Or at the discretion of the Architect, a mockup on 48 by 48 inches of each terrazzo color on a plywood substrate that is portable.
 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.
- F. Preinstallation Conference: Conduct conference at Project site.
1. Review methods and procedures related to terrazzo including, but not limited to, the following:
 - a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Review special terrazzo designs and patterns.
 - d. Review dust-control procedures.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.

- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.
- B. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.
- C. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- D. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- E. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

1.8 WARRANTY

- A. Labor and Material Warranty: Submit a written warranty, signed by both Installer and Manufacturer for epoxy resin terrazzo flooring system for a period of one year. Warranty includes loss of bond and damage due to normal wear and tear.
 - 1. Exclusions: Not included are damage due to bubbling or loss of adhesion due to moisture penetration through substrate, Acts of God or other elements beyond the scope of protection of this system, and reflective cracks from the substrate.
 - 2. Claims: In the event of warranty claim, Owner will notify manufacturer and installer in writing within 30 days of first appearance of any problems which are covered under this warranty, and will provide access to area during normal working hours. Owner is responsible for property protection. Remedy is limited to direct repair of epoxy resin terrazzo flooring system.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- B. FloorScore Compliance: Terrazzo floors shall comply with requirements of FloorScore Standard.

2.2 EPOXY-RESIN TERRAZZO (TRZ-1, TRZ-2)

- A. Epoxy-Resin Terrazzo: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.
 - 1. Manufacturers: Subject to compliance with requirements, provide Basis-of-Design products indicated on Interior Finish Legend or comparable products by one of the following:
 - a. Master Terrazzo Technologies; Morricite Epoxy Terrazzo (Basis-of-Design).
 - b. Dex-O-Tex; a Crossfield Products company.

- c. Key Resin Company.
 - d. Terrazzo & Marble Supply Companies; Terroxy Resin Systems.
2. Thickness: 3/8 inch nominal.
 3. Custom Mix Color and Pattern: As selected by Architect from manufacturer's full range.

B. Materials:

1. Primer: Manufacturer's product recommended for substrate and use indicated.
2. Epoxy-Resin Matrix: Manufacturer's standard recommended for use indicated and in color required for mix indicated.
 - a. Physical Properties without Aggregates:
 - 1) Hardness: 60 to 85 per ASTM D 2240, Shore D.
 - 2) Minimum Tensile Strength: 3000 psi per ASTM D 638 for a 2-inch specimen made using a "C" die per ASTM D 412.
 - 3) Minimum Compressive Strength: 10,000 psi per ASTM D 695, Specimen B cylinder.
 - 4) Chemical Resistance: No deleterious effects by contaminants listed below after seven-day immersion at room temperature per ASTM D 1308.
 - a) Distilled water.
 - b) Mineral water.
 - c) Isopropanol.
 - d) Ethanol.
 - e) 0.025 percent detergent solution.
 - f) 1.0 percent soap solution.
 - g) 10 percent sodium hydroxide.
 - h) 10 percent hydrochloric acid.
 - i) 30 percent sulfuric acid.
 - j) 5 percent acetic acid.
 - b. Physical Properties with Aggregates: For resin blended with Georgia white marble, ground, grouted, and cured per requirements in NTMA's "Terrazzo Specifications and Design Guide"; comply with the following:
 - 1) Flammability: Self-extinguishing, maximum extent of burning 1/4 inch per ASTM D 635.
 - 2) Thermal Coefficient of Linear Expansion: 0.0025 inch/inch per deg F for temperature range of minus 12 to plus 140 deg F per ASTM D 696.
3. Aggregates: Comply with NTMA gradation standards for mix indicated and contain no deleterious or foreign matter.
 - a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131.
 - b. 24-Hour Absorption Rate: Less than 0.75 percent.
 - c. Dust Content: Less than 1.0 percent by weight.
4. Finishing Grout: Resin based.

2.3 PRECAST EPOXY-RESIN TERRAZZO

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Master Terrazzo Technologies; Morricite Epoxy Terrazzo (Basis-of-Design).
 2. Terrazzo & Marble Supply Companies; Terroxy Resin Systems.
 3. Key Resin Company.
 4. Tectura Designs; a Wausau Tile Inc. brand.

- B. Precast Terrazzo Base (TZB-1): Minimum 3/8-inch- thick, reinforced portland cement terrazzo units cast in maximum lengths possible, but not less than 36 inches. Comply with NTMA's written recommendations for fabricating precast terrazzo base units in sizes and profiles indicated.
1. Type: Cove.
 2. Height: 4 inches.
 3. Outside Corner Units: With finished returned edges at outside corner.
 4. Color, Pattern, and Finish: As indicated on Interior Finishes Legend on Drawings.

2.4 STRIP MATERIALS

- A. Thin-Set Divider Strips: L-type angle, 1/4 inch deep.
1. Material: White-zinc alloy.
 2. Top Width: 1/8 inch.
- B. Control-Joint Strips: Separate, double L-type angles, positioned back to back, that match material and color of divider strips and in depth required for topping thickness indicated.
- C. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
1. Base-bead strips for exposed top edge of terrazzo base.
 2. Edge-bead strips for exposed edges of terrazzo.

2.5 MISCELLANEOUS ACCESSORIES

- A. Strip Adhesive: Epoxy-resin adhesive recommended by adhesive manufacturer for this use.
1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Anchoring Devices:
1. Strips: Provide mechanical anchoring devices or adhesives for strip materials as recommended by manufacturer and required for secure attachment to substrate.
- C. Patching and Fill Material: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- D. Joint Compound: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- E. Resinous Matrix Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.
- F. Sealer: Slip- and stain-resistant, penetrating-type sealer that is chemically neutral; does not affect terrazzo color or physical properties; is recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.
1. Surface Friction: Not less than 0.6 according to ASTM D 2047.
 2. Acid-Base Properties: With pH factor between 7 and 10.
 3. Sealers shall have a VOC content of 200 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 and 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, including levelness tolerances, have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.
- B. Concrete Slabs:
 - 1. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written recommendations.
 - c. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.
- C. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - 1. Moisture Testing: Perform tests indicated below.
 - a. In-Situ Probe Test: Perform relative-humidity test using in-situ probes per ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative-humidity-level measurement.
 - b. Test Method: Test for moisture content by method recommended in writing by terrazzo manufacturer. Proceed with installation only after substrates pass testing.
- D. Protect other work from water and dust generated by grinding operations. Control water and dust to comply with environmental protection regulations.
 - 1. Erect and maintain temporary enclosures and other suitable methods to limit water damage and dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

3.3 EPOXY-RESIN TERRAZZO INSTALLATION

- A. Comply with NTMA's written recommendations for terrazzo and accessory installation.
- B. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions and NTMA's "Terrazzo Specifications and Design Guide."
- C. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet; noncumulative.

- D. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
- E. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.
- F. Primer: Apply to terrazzo substrates according to manufacturer's written instructions.
- G. Strip Materials:
 - 1. Divider and Control-Joint Strips:
 - a. Locate divider strips in locations indicated.
 - b. Install control-joint strips back to back directly above concrete-slab control joints.
 - c. Install control-joint strips with 1/4-inch gap between strips, and install sealant in gap.
 - d. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
 - 2. Accessory Strips: Install as required to provide a complete installation.
 - 3. Abrasive Strips: Install with surface of abrasive strip positioned 1/16 inch higher than terrazzo surface.
- H. Finishing:
 - 1. Rough Grinding: Grind with 24 or finer grit stones or with comparable diamond plates. Follow initial grind with 80 or finer grit stones.
 - 2. Grouting: Cleanse floor with clean water and rinse thoroughly. Remove excess rinse water by wet vacuum and machine or hand apply epoxy grout to fill voids.
 - 3. Fine Grinding: Grind with 120 or finer grit stones until all grout is removed from surface. Repeat rough grinding, grout coat, and fine grinding if large voids exist after initial fine grinding. Produce surface with a minimum of 70 percent aggregate exposure.
- I. Remove and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.
- J. Construction Tolerances: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet.

3.4 REPAIR

- A. Cut out and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.5 CLEANING AND PROTECTION

- A. Cleaning:
 - 1. Remove grinding dust from installation and adjacent areas.
 - 2. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow them to dry thoroughly.
- B. Sealing: Apply minimum 2 coats of recommended sealer.
 - 1. Seal surfaces according to NTMA's written recommendations.
 - 2. Apply sealer according to sealer manufacturer's written instructions.

- C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION 096623

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes modular, tufted carpet tile.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. 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.
 - 3. Pattern of installation.
 - 4. Pattern type, location, and direction.
 - 5. Type, color, and location of edge, transition, and other accessory strips.
 - 6. 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.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

1.4 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.
- B. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

1.7 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.8 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 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 loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
 - 3. Warranty Period: 15 years from date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design indicated or comparable products by one of the following:
 - 1. Interface (Basis-of-Design).
 - 2. J & J Industries.
 - 3. Mannington Commercial.
 - 4. Patcraft; a Shaw Industries company.
 - 5. Shaw Contract.

2.2 CARPET TILE

A. Carpet Tile (CPT-1):

1. Basis of Design: Interface; Eben.
2. Construction: 100% Solution-dyed nylon.
3. Face Weight: 20 oz/sq. yd.
4. Gage: 1/12.
5. Stitches per Inch: 8.30.
6. Finished Pile Thickness: 0.10 inch.
7. Size: As indicated on Interior Finishes Legend on Drawings.
8. Applied Soil-Resistance Treatment: Manufacturer's standard material.
9. Antimicrobial Treatment: Manufacturer's standard material.
10. Color: As indicated on Interior Finishes Legend on Drawings.

B. Carpet Tile (CPT-2 to CPT-6):

1. Basis of Design: Interface; Mesa.
2. Construction: 100% Solution-dyed nylon.
3. Face Weight: 19 oz/sq. yd.
4. Gage: 1/12.
5. Stitches per Inch: 8.30.
6. Finished Pile Thickness: 0.08 inch.
7. Size: As indicated on Interior Finishes Legend on Drawings.
8. Applied Soil-Resistance Treatment: Manufacturer's standard material.
9. Antimicrobial Treatment: Manufacturer's standard material.
10. Color: As indicated on Interior Finishes Legend on Drawings.

2.3 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 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. 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 85 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
3. Subfloor finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" for slabs receiving carpet tile.
 4. 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. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. 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 monolithic installation instructions.
- B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive 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.

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, "Protection of 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 096813

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SECTION 097200 - WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Tackable wall covering.
 - 2. Wood-veneer wall covering.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
- B. Shop Drawings: Show location and extent of each wall-covering type. Indicate veneer matching seams and termination points.
- C. Samples for Verification: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36 inches long in size.
 - 1. Wood-Veneer Wall-Covering Sample: From same flitch to be used for the Work, with specified finish applied.
- D. Product Schedule: For wall coverings. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same production run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wall-Covering Materials: For each type, color, texture, and finish, full width by length to equal to 5 percent of amount installed.

1.7 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for installation.
1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F1141 for appearance shading characteristics.
 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 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.
1. Wood-Veneer Wall Coverings: Condition spaces for not less than 48 hours before installation.
- B. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates in accordance with test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. 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: 450 or less.

2.2 TACKABLE WALL COVERING (TWC-1)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
1. Koroseal Interior Products (Basis-of-Design).
 - a. Product: Walltalkers Tac-Wall.
 2. Forbo; Bulletin Board.
 3. MDC Wallcoverings.
 4. National Solutions.
- B. Description: Uni-color resilient homogenous tackable linoleum surface consisting of linseed oil, granulated cork, rosin binders, and dry pigments calendared onto natural burlap backing.
- C. Width: 72 inches.

- D. Thickness: 1/4 inch.
- E. Applied Backing Material: Jute (burlap).
- F. Color: As indicated on Interior Finishes Legend on Drawings.

2.3 WOOD-VENEER WALL COVERING (WWC-1)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - 1. Wolf-Gordon (Basis-of-Design).
 - a. Product: Wonderwood.
 - 2. Forestree Wood Wallcovering.
 - 3. Jacaranda, Inc.
 - 4. Koroseal Interior Products.
 - 5. National Solutions.
- B. Description: Provide wood-veneer wall covering in rolls from same production run.
- C. Sheet Size: As indicated on Interior Finishes Legend on Drawings.
- D. Veneer Construction: Single-ply veneer.
- E. Wood Species: Maple, as indicated on Interior Finishes Legend on Drawings.
- F. Sheet Match: Sequence.
- G. Applied Backing Material: Cellulose with foil stabilizer.
- H. Finish: Matte with UV inhibitor; factory applied using wall-covering manufacturer's standard system.

2.4 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.
- B. Trim: Manufacturer's trim pieces as detailed on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation surfaces being true in plane and vertical and horizontal alignment, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, and mildew.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Gypsum Board: Apply primer/sealer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
- D. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- E. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION OF WALL COVERING

- A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.
- B. Install seams vertical and plumb at least 6 inches from outside corners and 6 inches from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.
- C. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.
- D. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.4 CLEANING

- A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 097200

SECTION 097713 - STRETCHED-FABRIC WALL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes site-upholstered wall systems.

1.2 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.
- B. SAA: Sound Absorption Average.

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 fabric facing, frame edge and trim, core material, and mounting indicated.
- B. Shop Drawings: For each stretched-fabric system.
 - 1. Include plans, elevations, sections, and installation and system details.
 - 2. Include details at head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate frame-edge profile and core materials.
 - 3. Include details at cutouts and penetrations for other work.
 - 4. Include direction of fabric weave and pattern matching.
- C. Samples: For each type of fabric facing.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Electrical outlets, switches, and thermostats.
 - 2. Items penetrating or covered by stretched-fabric systems including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Alarms.
 - e. Sprinklers.
 - f. Access panels.
 - 3. Show operation of hinged and sliding components covered by or adjacent to stretched-fabric systems.
- B. Qualification Data: For Installer.

- C. Product Certificates: For each type of stretched-fabric system.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For stretched-fabric systems to include in maintenance manuals. Include fabric manufacturer's written cleaning, stain-removal, restretching, and reupholstering instructions.

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. Fabric: For each fabric, color, and pattern installed, furnish length equal to 10 percent of amount installed, but no fewer than 10 sq. yd., full width of bolt.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
 - 1. Build mockup of typical wall area 48 inches wide by full height. Include intersection of wall and ceiling, corners, and perimeters.
 - 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. Comply with fabric and stretched-fabric system manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install stretched-fabric systems until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install stretched-fabric systems until a permanent level of lighting is provided on surfaces to receive stretched-fabric systems.
- C. Air-Quality Limitations: Protect stretched-fabric systems from exposure to airborne odors such as tobacco smoke, and install systems under conditions free from odor contamination of ambient air.

1.11 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of stretched-fabric systems that fail in performance, materials, or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Acoustical performance.
 - b. Fabric sagging, distorting, or releasing from panel edge.
 - c. Warping of core.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain stretched-fabric wall systems specified in this Section from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Stretched-fabric wall systems are to comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency on systems prepared according to ASTM E2573. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.

2.3 STRETCHED-FABRIC WALL SYSTEMS

- A. Stretched-Fabric Wall System (AWP-1 to AWP-16): Manufacturer's standard system consisting of facing material stretched tightly over a frame and core material and secured in the frame.
1. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or comparable products by one of the following:
 - a. Accutrack Systems; AccuSnap (Basis of Design).
 - 1) Product: ACCUSNAP.
 - b. Decoustics.
 - c. FabriTRAK Systems, Inc.
 - d. Novawall Systems.
 2. Core: Manufacturer's standard.
 - a. Core-Face Layer: Manufacturer's standard tackable, impact-resistant, high-density board.
 - b. Nominal Core Thickness: 1 inch.
 3. Core Overlay: Polyester batting, manufacturer's standard thickness.

4. Frame Edge: Square profile.
 - a. Fabric-Insertion Point: Bottom load.
 - b. Nominal Frame Thickness: Match nominal core thickness.
5. Frame Color: Prepainted color as selected by Architect from full range of manufacturer's colors.
6. Reveals between Panels: As indicated on Drawings.
7. Facing Material: As indicated on Interior Finishes Legend.
8. Acoustical Performance: Sound absorption NRC of not less than 0.90 according to ASTM C423 for Type A mounting according to ASTM E795.
9. Panel Sizes: Varies; as indicated on Interior Finishes Legend and elevations on Drawings.
10. Nominal Overall System Thickness: 1inch.

2.4 MATERIALS

A. Core Materials: Manufacturer's standard.

1. Glass-Fiber Board: ASTM C612; of type standard with manufacturer; nominal density of 6 to 7 lb/cu. ft., unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
2. Tackable, Impact-Resistant, High-Density Board for Face Layer: 1/8-inch- thick layer of compressed molded glass-fiber board with a nominal density of 16 to 18 lb/cu. ft. laminated to face of core.
3. Core Overlay: Flame-retardant, compressible, fiberfill, polyester batting.
4. Wood and Plywood: Manufacturer's standard plywood or clear, vertical grain, straight, kiln-dried hardwood.
 - a. Fire-retardant treated by pressure process with a flame-spread index of 25 or less when tested according to ASTM E84 or UL 723, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1) Treated material is to have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity.
 - 2) Kiln-dry material after treatment to 7 to 13 percent or less for lumber and 15 percent or less for plywood.

B. Frame Construction: Manufacturer's standard, continuous, extruded plastic frame (track).

C. Facing Material: Fabric from same dye lot; color and pattern as indicated on Interior Finishes Legend.

1. Basis of Design: Maharam.
2. Fiber Content: 100 percent woven polyester.
3. Width: 66 inches.

2.5 INSTALLATION MATERIALS

A. Installation Products: Concealed on back of system, recommended by stretched-fabric system manufacturer to support weight of system, fabric tension, and as follows:

1. Fasteners: Manufacturer's standard.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine fabric, materials, substrates, areas, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of stretched-fabric systems.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each area and establish layout of panels and joints of sizes indicated on Drawings within a given area.
- B. Before installation, allow fabric to adjust and become stable in spaces where it will be installed according to stretched-fabric system manufacturer's written instructions. Acclimatize fabric for minimum of 24 hours at ambient temperature and humidity conditions indicated for spaces when occupied for their intended use.

3.3 INSTALLATION

- A. Install stretched-fabric systems according to system manufacturer's written instructions.
 - 1. Provide continuous perimeter frames of each profile indicated, designed to be inconspicuous when covered by fabric facing, with smooth edges, and with surface finish that will not telegraph through fabric facing.
 - 2. Install framing around penetrations.
 - 3. Tightly fit framing to adjacent construction and securely attach to substrate.
 - 4. Install core material with full coverage, flush with face of stretched-fabric system frame.
 - 5. Attach frame and core to substrate with adhesive or fasteners or both to support system and prevent deformation of components.
 - 6. Install stretched-fabric systems level and plumb unless otherwise indicated, true in plane, and with fabric square to the grain.
 - 7. Install jointed panels with butt joints as indicated.
 - 8. Provide wood or plywood nailing strips and blocking as indicated on Drawings or as required.
- B. Fabric Installation: Apply fabric monolithically in continuous run over area, without joints or reveals, except where panel joints or midspan frames are indicated.
 - 1. Fabric Direction: Run fabric railroaded.
 - 2. Fabric Sequence: Maintain sequence of fabric drops; match and level fabric pattern and grain.
 - 3. Fabric Alignment: Install fabric with patterns or directional weaves so pattern or weave aligns with adjacent panels.
 - 4. Fabric Seams: Sewn seams are not permitted.
 - 5. Core Overlay: Evenly stretch over core face and edges; free from puckers, ripples, wrinkles, and sags.
 - 6. Stretch and secure fabric to frame edges and so frame and frame attachment method are concealed by fabric unless otherwise indicated.
 - 7. Stretch fabric tightly and square without puckers, ripples, or distortions. Acclimatize and restretch if recommended by stretched-fabric system manufacturer. Repair distortions, wrinkles, and sagging.

3.4 INSTALLATION TOLERANCES

- A. Edge Straightness: Plus or minus 1/16 inch in 48 inches.

- B. Variation from Level and Plumb: Plus or minus 1/16 inch in 48 inches, noncumulative.
- C. Variation of Joint Width: Not more than 1/16 inch in 48 inches from hairline, noncumulative.

3.5 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 097713

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Primers.
 2. Water-based finish coatings.
 3. Floor sealers.
 4. Dry fall coatings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
1. Include preparation requirements and application instructions.
 2. Indicate VOC content.
- B. Samples for Verification: For each type of paint system and 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 Schedule: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.3 CLOSEOUT SUBMITTALS

- A. Coating Maintenance Manual: Upon completion of the Project, submit a coating maintenance manual.
1. The manual shall include the following information:
 - a. A coating finish schedule designating where each product/color/finish was used.
 - b. Mix formulas for each color used.
 - c. Product data pages.
 - d. Material Safety Data Sheets.
 - e. Care and cleaning instructions.
 - f. Touch-up procedures.
 - g. Color sample of each color and finish used.

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. Paint Products: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 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.

1.6 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.

1.7 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 of 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:
1. Benjamin Moore & Co.
 2. PPG Paints.
 3. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting Schedule for the paint category indicated found at the end of Part 3.
- C. Source Limitations: Obtain each paint product from single source from single manufacturer.

2.2 PAINT PRODUCTS, 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. Colors: As indicated on Finish Schedule on Drawings.

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. Masonry (Clay and CMUs): 12 percent.
 3. Wood: 15 percent.
 4. 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 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. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, and loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
- G. 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.
- H. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 INSTALLATION

- 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 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. Back-Rolling: Back roll all spray applications on walls and ceilings to allow for touch up.
- F. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms:
 - a. Hot- and cold-water piping; fire-suppression piping.
 - 2. Paint the following work where exposed in occupied spaces:

- a. Hot- and cold-water piping; fire-suppression piping.

3.4 WALL IDENTIFICATION

- A. Permanently label fire barriers, fire partitions, fire walls, smoke barriers, and smoke partitions 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 feet from end of wall and at intervals not exceeding 20 feet.
 2. Apply a minimum one-inch-wide bright red horizontal line, both sides of wall, interrupted for approved text, at the required interval.

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.
 1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
 2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
 3. Allow empty paint cans to dry before disposal.
 4. Collect waste paint by type and deliver to recycling or collection facility.
- 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. Concrete Substrates, Traffic Surfaces (SCN-1):
 1. Penetrating Concrete Floor Sealer: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Sherwin-Williams; H&C Clear Liquid Hardener & Densifier (Basis-of-Design).

- 2) Dayton Superior; Sure Hard Densifier J17.
- 3) Euclid Chemical; Euro Diamond Hard.
- 4) L & M Construction Chemicals, Inc.; Laticrete Seal Hard.
- 5) Meadows, W.R. Inc.; Liqui-Hard.

B. CMU Substrates:

1. Institutional Low-Odor/VOC Latex System:

- a. Block Filler: Interior/exterior latex block filler.
 - 1) Products: Subject to compliance with requirements, provide one of the following:
 - a) Benjamin Moore: Ultra Spec Hi-Build Masonry Block Filler, 571.
 - b) PPG Paints: Speedhide Int/Ext Acrylic Masonry Hi-Fill Block Filler Latex, 6-15XI.
 - c) Sherwin-Williams; PrepRite Int/Ext Block Filler, B25W25.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, latex, institutional low odor/VOC, semigloss.
 - 1) Products: Subject to compliance with requirements, provide one of the following:
 - a) Benjamin Moore; Ultra Spec 500 Interior Gloss Finish, N540.
 - b) PPG Paints; Speedhide Zero Interior Zero-VOC Latex Semi Gloss, 6-4510XI.
 - c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series.

2. (Epoxy System) Water-Based Light-Industrial Coating System:

- a. Block Filler: Interior/exterior latex block filler.
 - 1) Products: Subject to compliance with requirements, provide one of the following:
 - a) Benjamin Moore: Ultra Spec Hi-Build Masonry Block Filler, 571/K571.
 - b) PPG Paints; Speedhide Int./Ext. Masonry Hi Fill Latex Block Filler, 6-15 XI.
 - c) Sherwin-Williams; Pro Industrial Heavy Duty Block Filler, B42W00150.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat; Interior Pre-Catalyzed Epoxy, semi-gloss (Gloss Level 5):
 - 1) Products: Subject to compliance with requirements, provide one of the following:
 - a) Benjamin Moore; Corotech Pre Catalyzed Waterborne Epoxy Semi-Gloss, V341.
 - b) PPG Paints; Pitt-Glaze WB1 Interior Semi-Gloss Pre-Catalyzed Water-borne Epoxy, 16-510 Series.
 - c) Sherwin-Williams; Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46W01151.

C. Steel Substrates:

1. Institutional Low-Odor/VOC Latex System:

- a. Prime Coat: Water-based rust-inhibitive primer.
 - 1) Products: Subject to compliance with requirements, provide one of the following:
 - a) Benjamin Moore; Ultra Spec HP Acrylic Metal Primer, HP04.
 - b) PPG Paints; Pitt-Tech Int/Ext DTM Industrial Primer, 90-712.
 - c) Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer, B66W01310.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5).

- 1) Products: Subject to compliance with requirements, provide one of the following:
 - a) Benjamin Moore; Ultra Spec 500 Interior Semi-Gloss Finish, N539.
 - b) PPG Paints; Speedhide Zero Interior Zero-VOC Latex Semi Gloss, 6-4510XI.
 - c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series.
 2. Water-Based Dry-Fall System:
 - a. Prime Coat: Shop primer specified in Section where substrate is specified.
 - b. Topcoat: Dry fall, latex, flat.
 - 1) Products: Subject to compliance with requirements, provide one of the following:
 - a) Benjamin Moore; Latex Dry Fall – Flat, 395.
 - b) PPG Paints; Speedhide Super Tech WB Interior Dry Fog Flat Latex, 6-725XI.
 - c) Sherwin-Williams; Pro Industrial Waterborne Acrylic Dryfall, B42W00181.
- D. Wood Substrates: Wood trim and doors.
1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer, latex, for interior wood.
 - 1) Products: Subject to compliance with requirements, provide one of the following:
 - a) Benjamin Moore; Insl-X Prime All Multi-Surface Latex Primer Sealer (AP-1000).
 - b) PPG Paints; Seal Grip Int/Ext Acrylic Universal Primer/Sealer 17-921XI Series.
 - c) Sherwin-Williams; PrepRite ProBlock Primer Interior Exterior Sealer, B51W00620.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5).
 - a) Benjamin Moore; Ultra Spec 500 Interior Gloss Finish, N540.
 - b) PPG Paints; Speedhide Zero Interior Zero-VOC Latex Semi Gloss, 6-4510XI.
 - c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series.
- E. Gypsum Board Substrates:
1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Interior, institutional low-odor/VOC primer sealer.
 - 1) Products: Subject to compliance with requirements, provide one of the following:
 - a) Benjamin Moore; Ultra Spec 500 Zero VOC Primer, N534.
 - b) PPG Paints; Speedhide Interior Latex Sealer Quick Drying, 6-2.
 - c) Sherwin-Williams; ProMar 200 Latex Primer, B28W02600.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1).
 - 1) Products: Subject to compliance with requirements, provide one of the following:
 - a) Benjamin Moore; Ultra Spec 500 Interior Flat Finish, N536.
 - b) PPG Paints; Speedhide Zero Interior Zero-VOC Flat, 6-4110XI.
 - c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Flat, B30-2600 Series.
 - d. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5).

- 1) Products: Subject to compliance with requirements, provide one of the following:
 - a) Benjamin Moore; Ultra Spec 500 Interior Semi-Gloss Finish, N539.
 - b) PPG Paints; Speedhide Zero Interior Zero-VOC Latex Semi Gloss, 6-4510XI.
 - c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series.
2. (Epoxy System) Water-Based Light-Industrial Coating System:
 - a. Prime Coat: Interior latex primer sealer.
 - 1) Products: Subject to compliance with requirements, provide one of the following:
 - a) Benjamin Moore; Eco Spec WB Interior Latex Primer, N372.
 - b) PPG Paints; Speedhide Interior Latex Sealer Quick Drying, 6-2.
 - c) Sherwin-Williams; ProMar 200 Latex Primer, B25W2600.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat; Interior Pre-Catalyzed Epoxy, semi-gloss, (Gloss Level 5):
 - 1) Products: Subject to compliance with requirements, provide one of the following:
 - a) Benjamin Moore; Corotech Pre Catalyzed Waterborne Epoxy Semi-Gloss, V341.
 - b) PPG Paints; Pitt-Glaze WB1 Interior Semi-Gloss Pre-Catalyzed Water-borne Epoxy, 16-510 Series.
 - c) Sherwin-Williams; Pro Industrial Pre-Cat Epoxy Semi-Gloss, K46-150 Series.

END OF SECTION 099123

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Visual display board assemblies.
 2. Display rails.

1.2 ACTION SUBMITTALS

- A. Product Data:
1. Visual display board assemblies.
 2. Display rails.
- B. Product Data Submittals: For each product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
- C. Shop Drawings: For visual display units.
1. Include plans, elevations, sections, details, and attachment to other work.
 2. Show locations of panel joints.
 3. Show locations and layout of special-purpose graphics.
 4. Include sections of typical trim members.
- D. Samples for Verification: For each type of visual display unit indicated.
1. Visual Display Panel: Not less than 8-1/2 by 11 inches, with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.
 2. Trim: 6-inch- long sections of each trim profile.
 3. Display Rail: 6-inch- long section of each type.
 4. Accessories: Full-size Sample of each type of accessory.
- E. Product Schedule: For visual display units. Use same designations indicated on Drawings.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.5 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces exhibit crazing, cracking, or flaking.
 2. Warranty Period:
 - a. 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. 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.

2.2 VISUAL DISPLAY BOARD ASSEMBLIES

- A. Visual Display Board Assemblies:
1. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design indicated or comparable products by one of the following:
 - a. Claridge Products & Equipment, Inc. (Basis-of-Design).
 - 1) Products: As indicated on Equipment Schedule on Drawings.
 - b. ADP Lemco.
 - c. ASI Visual Display Products.
 - d. Egan Visual.
- B. Visual Display Board Assembly: Field or factory fabricated.
1. Assembly: markerboard and tackboard.
 2. Corners: Square.
 3. Width: As indicated on Drawings.
 4. Height: As indicated on Drawings.
 5. Mounting Method: Direct to wall.
- C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.
1. Color: White.
- D. Tackboard Panel: Plastic-impregnated-cork tackboard panel on core indicated.
1. Fabric Wrapped Edge: Wrap edge of tackboard panel with fabric facing.
 2. Color and Pattern: As selected by Architect from full range of industry colors.
- E. Pegboards: 1/4-inch thick hardboard with 9/32 inch diameter holes 1-inch o.c.

- F. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- thick, extruded aluminum; of size and shape indicated on Drawings.
1. Field-Applied Trim: Manufacturer's standard, snap-on trim with no visible screws or exposed joints.
 2. Aluminum Finish: Clear anodic finish.
- G. Combination Assemblies: Provide H-trim between abutting sections of visual display panels.
- H. Chalktray: Manufacturer's standard; continuous.
1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
- I. Display Rail (DR-1 to DR-6): Manufacturer's standard, extruded-aluminum display rail with plastic-impregnated-cork insert, end stops, designed to hold accessories.
1. Basis-of-Design: Claridge Products & Equipment.
 - a. Products: As indicated on Equipment Schedule on Drawings.
 2. Size: 2 inches high by length indicated on Drawings.
 3. Map Hooks: Two map hooks for every 48 inches of display rail or fraction thereof.
 4. Flag Holder: Two for each room.
 5. Tackboard Insert Color: As selected by Architect from full range of industry colors.
 6. Aluminum Color: Match finish of visual display assembly trim.

2.3 MARKERBOARD PANELS

- A. Porcelain-Enamel Markerboard Panels (MB-1, MB-2, MB-3): Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.
1. Face Sheet Thickness: 0.021 inch uncoated base metal thickness.
 2. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard moisture-barrier backing.
 3. Particleboard Core: 3/8 inch thick; with 0.005-inch- thick, aluminum foil backing.
 4. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.
 5. Sizes: As indicated on Equipment Schedule on Drawings.
- B. High-Pressure Markerboard Laminate Panels: Factory-laminated markerboard panel of three-ply construction, consisting of backing, fiberboard core material, and high-pressure markerboard laminate writing surface.
- C. Melamine Markerboard Panels: Fabricated from 1/4-inch- thick, sealed and primed hardboard panels permanently bonded with thermally fused, melamine-impregnated decorative paper writing surface.

2.4 TACKBOARD PANELS

- A. Tackboard Panels (TB-1, TB-2, TB-3):
1. Facing:
 - a. 1/4-inch- thick, natural cork.
 2. Core:
 - a. 1/4-inch- thick particleboard.

2.5 MATERIALS

- A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.
- B. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish; with surface-burning characteristics indicated.
- C. Plastic-Impregnated-Cork Sheet: Seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto fabric backing; with washable vinyl finish and integral color throughout; with surface-burning characteristics indicated.
- D. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- E. Extruded Aluminum: ASTM B221, Alloy 6063.
- F. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. 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.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine walls and partitions for proper preparation and backing for visual display units.
- C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.
- D. Prime wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.
- E. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Field-Assembled Visual Display Board Assemblies: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.
 - 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
 - 2. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.
- C. Factory-Fabricated Visual Display Board Assemblies:
 - 1. Adhere to wall surfaces with egg-size adhesive gobs at 16 inches o.c., horizontally and vertically.
 - 2. Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.
- D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated below.

3.4 CLEANING AND PROTECTION

- A. Clean visual display units in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100

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SECTION 101200 - DISPLAY CASES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Display cases.

1.2 DEFINITIONS

A. Display Case: Glazed cabinet with tackboard panel back surface and adjustable shelves.

B. Tackboard Panel: A material for holding push-pins or tacks, typically consisting of a facing such as fabric, vinyl, or cork; adhered to a substrate such as fiberboard, hardboard, or particleboard.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Display cases.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for display cases. Include furnished specialties and accessories.
2. Include electrical characteristics for illuminated display cases.

C. Shop Drawings: For display cases.

1. Include plans, elevations, sections, and attachment details.
2. Show location of seams and joints in tackboard panels.
3. Include sections of typical trim members.
4. Include diagrams for wiring of illuminated display cases.

D. Samples for Verification: For each type of exposed finish for the following:

1. Tackboard Panel: Not less than 8-1/2 by 11 inches, with facing and substrate indicated for final Work. Include one panel for each type, color, and texture required.
2. Trim: 6-inch- long sections of each trim profile including corner section.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For display cases to include in maintenance manuals.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install display cases for indoor installations until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. 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.
- B. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 DISPLAY CASES (DC-1, DC-2)

- A. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - 1. Claridge Products and Equipment (Basis-of-Design).
 - a. Products: 370 Series.
 - 2. ABC School Equipment.
 - 3. C.R. Laurence Co.
 - 4. Tablet & Ticket Co.
 - 5. W.E. Neal Slate Co.
- B. Recessed Display Case: Factory-fabricated display case; with finished interior, operable glazed doors at front, and trim on face to cover edge of recessed opening.
 - 1. Display Case Cabinet: Extruded aluminum.
 - 2. Face Frame:
 - a. Aluminum.
 - 3. Aluminum Finish: Clear anodic.
- C. Glazed Sliding Doors: Tempered glass; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.
 - 1. Thickness: Not less than 5 mm thick.
 - 2. Number of Doors: As indicated on Drawings.
- D. Shelves: 6-mm-thick tempered glass; supported on adjustable shelf standards and supports.
 - 1. Shelf Depth: 12 inches.
 - 2. Number of Shelves: As indicated on Drawings.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112; recess mounted in rear surface. Provide standards extending full height of display case.
- F. Natural-Cork Back Panel: Natural-cork tackboard panel.
- G. Illumination System: Concealed top-lighting system consisting of LED-strip fixtures. Include lamps and internal wiring with single concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided.

- H. Size: As indicated on Drawings.

2.3 TACKBOARD PANELS

- A. Natural-Cork Tackboard Panel:
 - 1. 1/8-inch- thick, natural-cork sheet factory laminated to 3/8-inch- thick, fiberboard backing.

2.4 MATERIALS

- A. Fiberboard: ASTM C208.
- B. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish.
- C. Extruded-Aluminum Bars and Shapes: ASTM B221, Alloy 6063.
- D. Aluminum Tubing: ASTM B429/B429M, Alloy 6063.
- E. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- F. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

2.5 FABRICATION

- A. Fabricate display cases to requirements indicated for dimensions, design, and thickness and finish of materials.
- B. Use metals and shapes of thickness and reinforcing required to produce flat surfaces, and to impart strength for size, design, and application indicated.
- C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
- D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. 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.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of illuminated units.
- C. Examine walls and partitions for proper backing for display cases.
- D. Examine walls and partitions for suitable framing depth if recessed units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for display cases as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches o.c. Attach aluminum trim over edges of recessed display cases and conceal grounds and clips. Attach trim with fasteners at not more than 24 inches o.c.
- C. Comply with requirements specified elsewhere for connecting illuminated display cases.
- D. Install display case shelving level and straight.

3.4 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended in writing by manufacturer.
- B. Touch up factory-applied finishes to restore damaged areas.

END OF SECTION 101200

SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
1. Panel signs.
 2. Field-applied, vinyl-character signs.
 3. Building plaques.
 4. Exterior dimensional characters.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: Showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.
1. Provide message list for each sign required, including large-scale details of wording and lettering layout.
 2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
 3. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.
 4. Furnish full-size rubbings for metal plaques.
- C. Samples: Provide samples of each sign component for verification of compliance with requirements indicated.

1.3 QUALITY ASSURANCE

- A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.
- B. Accessibility Requirements: Comply with ADA Accessibility Guidelines. Machine-cut copy characters from opaque acrylic sheet and chemically weld onto the acrylic sign panel face or use photopolymer process to produce raised copy and Braille tags. Produce precisely formed characters with square cut edges free from burrs and cut marks.
- C. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
1. Illuminated Exit Signs: Refer to Division 26.
 2. Tactile Exit Signs.
 3. Stairway Identification.
 4. Room Capacity.
 5. Elevator Signs.
 6. Accessible Spaces.

7. Directional Signs.

- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 PANEL SIGNS

- A. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:
1. Manufactures: Subject to compliance with requirements, provide products by one of the following:
 - a. 2/90 Signs.
 - b. APCO Graphics, Inc.
 - c. ASI Sign Systems, Inc.
 - d. Innerface Sign Systems, Inc.
 2. PETG-Backed Photopolymer Sheet: Provide light-sensitive, water-wash photopolymer face layer bonded to PETG base layer to produce a composite sheet with overall, face layer, and base-layer thicknesses, respectively, of 0.120, 0.040, and 0.080 inch (3.0, 1.0, and 2.03 mm).
 3. Edge Condition: Square cut.
 4. Corner Condition: Square.
 5. Mounting: Unframed; two-faced tape.
 6. Color: As selected by Architect from manufacturer's full range.
 7. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch (0.8 mm) above surface with contrasting colors.
 8. Tactile Exit Signs: Provide a tactile "EXIT" sign complying with ICC/A117.1-2003, adjacent to each door to an egress stairway, an exit passageway, and the exit discharge.
 9. Safe Areas: Provide signage on or near doors indicating ADA areas of rescue-assistance.
 10. Provide signage at Areas of Refuge, complying with North Carolina State Building Code.
 11. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.
 - a. Color: Color matching sign or black. Confirm final color selection with Architect.
- B. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
1. Panel Material: Photopolymer.
 2. Raised-Copy Thickness: Not less than 1/32 inch.

2.2 FIELD-APPLIED, VINYL-CHARACTER SIGNS

- A. Field-Applied, Vinyl-Character Sign: Prespaced characters die cut from 3- to 3.5-mil thick, weather-resistant vinyl film with release liner on the back and carrier film on the front for on-site alignment and application.
1. Size: As required by Authority Having Jurisdiction.
 2. Substrate: Glass.
 3. Text and Font: As required by Authority Having Jurisdiction.

2.3 BUILDING PLAQUES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Advance Corporation; Braille-Tac Division.
 2. A. R. K. Ramos.
 3. Gemini Incorporated.
 4. Matthews International Corporation; Bronze Division.
 5. Metal Arts, LLC.
 6. Southwell Company (The).
- B. Cast Plaques: Provide castings free of pits, scale, sand holes, and other defects, as follows:
1. Plaque Material: Cast aluminum.
 2. Background Texture: Manufacturer's standard pebbled texture.
 3. Border Style: Single line bevel.
 4. Plaque Thickness: 0.625 inch.
 5. Plaque Size: 20 by 20 inches.
 6. Mounting: Concealed studs, noncorroding for substrates encountered.

2.4 EXTERIOR DIMENSIONAL CHARACTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. A. R. K. Ramos.
 2. ASI Sign Systems, Inc..
 3. GPP-Charleston Industries, Inc.
 4. Gemini Incorporated.
 5. Innerface Sign Systems, Inc.
 6. Metal Arts, LLC.
 7. Mohawk Sign Systems.
- B. Cast Characters: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements.
1. Character Material: Aluminum.
 2. Thickness: As required for letter height.
 3. Color(s): As selected by Architect from manufacturer's full range.
 4. Mounting: Concealed studs, noncorroding for substrates encountered with projected spacers.
- C. Dimensional Character Sign Schedule:
1. Character Size: As indicated on Drawings.
 2. Text/Message: As indicated.
 3. Location: As indicated.

4. The Owner reserves the right to alter or otherwise revise the final name of the school. Adjustment, if required in quantity of "letters" and "numbers" will be made by appropriate Change Order.

2.5 MATERIALS

- A. Plastic Laminate: Provide high-pressure laminate engraving stock with face and core plies as selected by Architect from manufacturer's full range.
- B. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.
- C. Aluminum Extrusions: Provide aluminum extrusions of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.
- D. Aluminum Castings: Provide aluminum castings of alloy and temper recommended by the sign manufacturer for the casting process used and for the use and finish indicated.
- E. Fasteners: Use concealed, tamper proof fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.
- F. Signage back plates: Provide signage back plates at locations where signage is installed on glass.
- G. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.
- H. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.6 FINISHES

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide colors as selected by the Architect from the manufacturer's full range.
- B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.
 1. Baked-Enamel Finish: AA-M4xC12C42R1x (Mechanical Finish: Manufacturer's standard, other nondirectional textured; Chemical Finish: Chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.
 - a. Organic Coating: Thermosetting-modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils, medium gloss.
 - b. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 - 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
 - 1. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
- C. Glass-Mounted Panel Signs: Attach panel signs to glass surfaces using the method indicated below:
 - 1. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
- D. Field-Applied, Vinyl-Character Signs: Clean and dry substrate. Align sign characters in final position before removing release liner. Remove release liner in stages, and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.
- E. Building Plaques: Mount plaques using the standard method recommended by the manufacturer for the type of wall surface indicated.
 - 1. Concealed Mounting: Mount the plaques by inserting threaded studs into tapped lugs on the back of the plaque. Set in predrilled holes filled with quick-setting cement.
- F. Dimensional Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.
 - 1. Flush Mounting: Mount characters with backs in contact with wall surface.
 - 2. Projected Mounting: Mount letters at the projection distance from the wall surface indicated.

3.2 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

PART 4 - END OF SECTION 101400

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SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cast dimensional characters.
 - a. Fabricated channel dimensional characters.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer of products.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

- A. Cast Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A. R. K. Ramos

- b. Avalis Wayfinding Solutions
 - c. Best Manufacturing
 - d. Matthews International, Inc.
 - e. Metallic Arts, Inc.
 - f. Signage Industries Corporation
2. Character Material: Cast aluminum.
 3. Character Height: As indicated on Drawings.
 4. Thickness: As indicated on Drawings.
 5. Finishes:
 - a. Integral Metal Finish: Mill.
 - b. Integral Aluminum Finish: Clear anodized.
 - c. Powder-Coat Finish: Manufacturer's standard, in color as selected by Architect from manufacturer's full range.
 6. Mounting: Concealed studs.
 7. Typeface: As selected by Architect from manufacturer's standard options.

2.2 DIMENSIONAL CHARACTER MATERIALS

- A. Aluminum Castings: ASTM B26/B26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.
- B. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Aluminum Extrusions: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.3 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
 1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. Sign Mounting Fasteners:
 - a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.4 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 1. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.5 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical 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 not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.
- B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

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.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF DIMENSIONAL CHARACTERS

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

SECTION 102113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes solid-polymer units as follows:
 - 1. Toilet Enclosures: Overhead braced, floor anchored.
 - 2. Urinal Screens: Wall mounted.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of cutouts for compartment-mounted toilet accessories.
 - 2. Show locations of reinforcements for compartment-mounted grab bars.
 - 3. Show locations of centerlines of toilet fixtures.
 - 4. Show overhead support or bracing locations.
- C. Samples for Verification: Of each type of color and finish required for units, prepared on 6-inch- square Samples of same thickness and material indicated for Work.

1.3 QUALITY ASSURANCE

- A. Comply with requirements in CID-A-A-60003, "Partitions, Toilets, Complete."
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 75 or less.
 - 2. Smoke-Developed Index: 450 or less.
- C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC A117.1 for toilet compartments designated as accessible.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SOLID-POLYMER UNITS (PTC-1)

- A. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or comparable products by one of the following:
1. American Specialties, Inc. (ASI); Global Partitions (Basis-of-Design).
 2. Bradley Corporation.
 3. General Partitions Manufacturing Corp.
 4. Scranton Products.
- B. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
1. Color and Pattern: As indicated on Interior Finishes Legend on Drawings.
- C. Urinal-Screen Construction: Flat-panel urinal screen matching panel construction.
- D. Pilaster Shoes: Manufacturer's standard design; stainless steel.
- E. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe matching that on the pilaster.
- F. Brackets (Fittings): Full-height (continuous) type of manufacturer's standard design; stainless steel.
- G. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer components to prevent burning.

2.2 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
1. Material: Stainless steel.
 2. Hinges: Manufacturer's premium grade paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
 3. Latch and Keeper: Manufacturer's premium grade surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
 4. Coat Hook: Manufacturer's premium grade combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
 5. Door Bumper: Manufacturer's premium grade rubber-tipped bumper at out-swinging doors.
 6. Door Pull: Manufacturer's premium grade unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at bottoms of posts. Provide shoes at posts to conceal anchorage.
- D. Door Size and Swings:
 - 1. Standard Compartments: Provide 24-inch clear opening with door swing as indicated on Drawings.
 - 2. Wheelchair and Ambulatory Accessible Compartments: Provide 32-inch clear opening with door swing as indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
 - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

- D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

SECTION 102123 - CUBICLE CURTAINS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
1. Curtain tracks and curtain carriers.
 2. Cubicle curtains.

1.2 PERFORMANCE REQUIREMENTS

- A. Curtains: Provide curtain fabrics with the following characteristics:
1. Fabrics are launderable to a temperature of not less than 160 deg F.
 2. Fabrics are flame resistant and are identical to those that have passed NFPA 701 when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.3 ACTION SUBMITTALS

- A. Product Data: Include durability, fade resistance, and fire-test-response characteristics for each type of curtain fabric indicated.
1. Include data on each type of applied curtain treatment.
- B. Shop Drawings: Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
- C. Samples: Full-size units of each type of the following products:
1. Curtain Fabric: 12-inch- square swatch or larger Sample as required to show complete pattern repeat, from dye lot used for the Work, with specified treatments applied. Mark top and face of material.
 2. Curtain Track: Not less than 4 inches long.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
1. Ceiling suspension assembly members.
 2. Method of attaching track hangers to building structure.
 3. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
- B. Product Certificates: Signed by manufacturers of tracks and curtains certifying that products furnished comply with requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For tracks and curtains to include in maintenance manuals specified in Division 1.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install cubicles 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.
- B. Field Measurements: Where cubicles 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. InPro Corporation (Basis-of-Design).
 - a. Product: NanoTrac with Clickeze Curtain.
 - 2. ADC; Automatic Devices Company.
 - 3. Construction Specialties Group.
 - 4. Imperial Privacy Systems.
 - 5. On The Right Track System

2.2 CURTAIN TRACKS

- A. Extruded-Aluminum Track: Not less than 3/8 inch wide by 1-1/2 inch high; with minimum wall thickness of 0.062 inch.
 - 1. Finish: Baked enamel, acrylic, or epoxy.
- B. Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.
- C. Curtain Carriers: Nylon glide or rollers with chrome-plated steel or aluminum hook.

2.3 CURTAINS

- A. Curtain Fabric:
 - 1. Basis of Design: InPro Corp.; Clickeze Curtain.
 - 2. Color: As selected by Architect from manufacturer's full range.
 - 3. Fiber Content: 100 percent polyester, inherently and permanently flame resistant.
- B. Mesh Top: Nylon mesh.
- C. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than 6 inches o.c.; machined into top hem.

2.4 CURTAIN FABRICATION

- A. Fabricate curtains to comply with the following requirements:

1. Width: Equal to track length from which curtain is hung plus 10 percent added fullness, but not less than 12 inches added fullness.
2. Length: Equal to floor-to-ceiling height minus 18 inches from finished ceiling at top, and minus 12 inches above finished floor at bottom.
3. Mesh Top: Top hem not less than 1 inch and not more than 1-1/2 inches wide, triple thickness, reinforced with integral web, and double lock stitched. Double lock stitch bottom of mesh directly to 1/2-inch triple thickness, top hem of curtain fabric.
4. Bottom Hem: Not less than 1 inch and not more than 1-1/2 inches wide, double thickness and single lock stitched.
5. Side Hems: Not less than 1/2 inch and not more than 1-1/4 inches wide, with double turned edges, and single lock stitched.
6. Vertical Seams: Not less than 1/2 inch wide, double turned and double stitched.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install tracks level and plumb, according to manufacturer's written instructions. Provide track fabricated from one continuous length up to 16 feet.
 1. Curtain Track Mounting: Surface.
- B. Surface Track Mounting: Fasten surface-mounted tracks at intervals of not less than 24 inches. Fasten support at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling with screws or with manufacturer's proprietary clip.
- C. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.
- D. Curtain Carriers: Provide curtain carriers adequate for 6-inch spacing along the full length of the curtain plus an additional carrier.
- E. Curtains: Hang curtains on each curtain track.

END OF SECTION 102123

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SECTION 102226 - OPERABLE PANEL PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manually operated, acoustical panel partitions.

1.2 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."
- B. NIC: Noise Isolation Class.
- C. NRC: Noise Reduction Coefficient.
- D. STC: Sound Transmission Class.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design operable panel partitions, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Seismic Performance: Operable panel partitions shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the panels will remain in place without separation of any parts from the system when subjected to the seismic forces specified."
- C. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
 - 1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.
- D. Surface Burning Characteristics of Vinyl Wall Covering Finish: ASTM E84, Class A.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, numbered panel installation sequence, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data for attachments, signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Indicate storage and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.

- C. Samples for Initial Selection: For each type of exposed material, finish, covering, or facing indicated.
1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed material, finish, covering, or facing indicated, prepared on Samples of size indicated below:
1. Textile: Full width by not less than 36-inch- long section of material from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat.
 2. Color and Pattern: Refer to Finish Schedule on drawings.
- E. Design Submittal: For operable panel partitions indicated to comply with performance requirements, including analysis data and calculations (Contractor to provide) signed and sealed by the qualified professional engineer responsible for their preparation.
1. Design Calculations: Calculate requirements for seismic design category as indicated on the structural drawings.
- F. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Flooring system minimum compressive strength at post locations.
 2. Blocking for ceiling anchors.
 3. Suspended ceiling components.
 4. Items penetrating finished ceiling, including the following:
 - a. Lighting fixtures.
 - b. HVAC ductwork, outlets, and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Smoke detectors.
 - f. Access panels.
- G. Setting Drawings: For embedded items and cutouts required in other work, including support-beam, mounting-hole template.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and testing agency.
- B. Seismic Qualification Certificates: For operable panel partitions, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Product Certificates: For each type of operable panel partition, from manufacturer.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each operable panel partition.
- E. Field quality-control reports.

- F. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. Exposed finishes of panels, trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
 2. Seals, hardware, track, carriers, and other operating components.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Fire-Test-Response Characteristics: Provide operable panel partitions with following fire-test-response characteristics, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings or applicable testing and inspecting agency:
1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 2. Fire Growth Contribution: Textile wall coverings complying with acceptance criteria of
 3. UBC standard 8-2.
- C. Qualification of Installers: Minimum five years successful experience in installing operable partitions over 25'0" high and accessories on comparable projects.
- D. Manufacturer Qualifications: Minimum five years experience in producing type of operable partitions specified. Provide references to Architect 10 days prior to bid.
- E. Approved Products: All manufacturers must submit samples and test reports for approval to Architect 10 days prior to bid.
1. Sample of panels to be furnished for this project. Provide sample with cut-away section showing panel construction and dimension of materials including steel face, framing members, and welding.
 2. Sample of track, trolley, hanger rod, and bracket to be furnished for this project.
 3. Provide a test report from a nationally recognized independent laboratory showing track/trolley/bracket/hanger rod assembly sustains a load of 6,000 pounds at mid-point of 48" simple span without damage.
 4. Provide a test report (4' x 23' long test specimen of the same construction as proposed for this project) from a nationally recognized independent laboratory showing that the panel is capable of resisting a uniform load of 20 pounds per square foot applied to the panel face without damage when tested in accordance with ASTM E-72.
 5. Provide all manufacturer's standard and extended warranties and other warranties as outlined in this section.
- F. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of operable panel partition openings by field measurements before fabrication.

1.10 WARRANTY

- A. Special Warranty: The entire system (track, trolley, panels, seals, hardware, etc.), except finishes shall be warranted by the manufacturer for a period of 10 years from the date of substantial completion. The warranty shall be a no-dollar-limit type material warranty to cover all direct and indirect costs except labor. An additional warranty shall be provided by the vendor for a period of 2 years from the date of substantial completion to cover installation/labor.

1.11 EXTRA MATERIALS

- A. Furnish extra materials from the same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Panel Finish-Facing Material: Furnish full width in quantity to cover both sides of two panels when installed.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Frame: Fully welded steel sheet, manufacturer's standard nominal minimum thickness but not less than 0.0508-inch-thick (16 gauge).
- B. Steel Face/Liner Sheets: Fully welded, tension-leveled steel sheet.
 - 1. Nominal minimum thickness for uncoated steel: manufacturer's standard, but not less than 0.0508-inch-thick (16 gauge).
- C. Gypsum Board: ASTM C 36/C 36M.
- D. Cement Board: ASTM C 1288.

2.2 OPERABLE ACOUSTICAL PANELS (OPP)

- A. Operable Acoustical Panels: Operable acoustical panel partition system including panels, seals, finish facing, suspension system, operators, and accessories.
 - 1. Product: Subject to compliance with requirements, provide operable partitions by one of the following:
 - a. Advanced Equipment (Basis-of-Design).
 - 1) Product: Alpha T Panels

- b. Modernfold.
 - c. Kwik-Wall.
- B. Panel Operation: Manually operated, top supported single panels. 25 lb maximum pull.
- C. Panel Construction: Steel framed panels with steel face sheets or laminated steel face sheets and manufacturer's standard core that will achieve STC rating indicated. Provide top reinforcement as required to support panel from suspension components and provide reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.
- 1. Face/Liner Sheets welded to frame with welds continuous or not less than every eight inches.
- D. Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
- 1. Panel Width: Equal widths.
- E. STC: Not less than 49.
- F. Panel Weight: Minimum 8.5 lbs/sq. ft. and maximum 12 lbs/sq.ft.
- G. Panel Thickness: Not less than 4 inches.
- H. Panel Closure:
- 1. Initial Closure: Flexible, resilient PVC, bulb-shaped acoustical seal.
 - 2. Final Closure: Constant-force, lever-operated mechanical closure expanding from panel edge to create a constant-pressure acoustical seal.
- I. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.

2.3 SEALS

- A. General: Provide types of seals indicated that produce operable panel partitions complying with acoustical performance requirements and the following:
- 1. Manufacturer's standard seals.
 - 2. Seals made from materials and in profiles that minimize sound leakage.
 - 3. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.
- B. Vertical Seals: Deep-nesting, interlocking astragals mounted on each edge of panel, with continuous PVC acoustical seal.
- C. Top Seals: Continuous-contact, extruded-PVC or PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on track when extended.
- D. Drop Seals for Single Panels: Retractable floor seals shall be spring loaded, internally guided and employ a waist high pivoted lever handle. The seal shall have a vertical travel range greater than 2" capable of acting as a locking mechanism to fix the panel in any desired location in the opening with constant pressure serving to seal each panel. The seal system shall be completely self-contained within each panel and have no visible mechanism or fasteners on any panel face. Seals shall be replaceable and repairable.

Portal panels hinged to full width panels shall have fixed-flexible floor seals. The base of these panels shall match in appearance the base of all other panels. Seal systems requiring holes in panel face or base will not be permitted.

2.4 FINISH FACING

- A. General: Provide finish facings for panels that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.
1. Apply facings free of air bubbles, wrinkles, blisters, and other defects, with edges tightly butted, and with no gaps or overlaps. Horizontal seams are not permitted. Tightly secure and conceal raw and selvage edges of facing for finished appearance.
 2. Where facings with directional or repeating patterns or directional weave are indicated, mark facing top and attach facing in same direction.
 3. Match facing pattern 72 inches above finished floor.
 4. Color/Pattern: As selected by Architect from manufacturer's full range.
- B. Finishes:
1. Panel Finish: Panel finish shall be Type II, 20 oz. vinyl wall covering.
 2. Panel Trim: Clear anodized.
 3. Antimicrobial Treatment: Additives capable of inhibiting growth of bacteria, fungi, and yeasts.

2.5 SUSPENSION SYSTEMS

- A. Suspension Tracks: Steel track mounted directly to overhead structural support, with adjustable steel hanger rods for overhead support, designed for type of operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
1. Panel Guide: Aluminum; finished with factory-applied, decorative, protective finish.
 2. Head Closure Trim: If required for acoustical performance; with factory-applied, decorative, protective finish.
 3. Maximum deflection of L/360 of span.
- B. Carriers: Trolley system shall be four independently replaceable steel wheels and tires (nylon or composite tires are not acceptable) with thrust type roller bearings (ball bearings are not acceptable), shielded and prelubricated. Bearings and wheels shall be independently replaceable and relubricatable.
- C. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.
- D. Steel Finish: Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

2.6 ACCESSORIES

- A. Pass Doors: Swinging door built into and matching panel materials, construction, acoustical qualities, finish and thickness, complete with frames and operating hardware. Hinges finished to match other exposed hardware.

1. Accessibility Standard: Fabricate doors to comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.
 2. Single Pass Door: 36 by 84 inches.
 3. Pass-Door Hardware: Equip pass door with the following:
 - a. Door Seals: Manufacturer's standard.
 - b. Panic hardware.
 - c. Concealed door closer.
 - d. Exit Sign: Recessed, self-illuminated.
 - e. Latchset: Passage set.
 - f. Lock: Key-operated lock with cylinder, keyed to master key system, operable from both sides of door. Include two keys per lock.
- B. Storage Pocket Doors: Full height at end of partition runs to conceal stacked partition; of same materials, finish, construction, thickness, and acoustical qualities as panels; complete with operating hardware and acoustical seals at soffit, floor, and jambs. Hinges in finish to match other exposed hardware.
1. Rim Lock: Deadlock to receive cylinder, to secure storage pocket door in closed position.
- C. Work Surfaces:
1. Surface: Tackable, vinyl-coated fabric wall covering, complying with CFFA-W-101-D, Type II, and indicated fire-test-response characteristics; laminated to natural cork tackboard.
 2. Surface Color: As selected by Architect from manufacturer's full range.
 3. Size: From 36 inches to 84 inches AFF on both sides of the panel.
 4. Trim: Aluminum slip-on or snap-on trim with no visible screws or exposed joints and with corners mitered to a neat, hairline joint.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with ASTM E 557 except as otherwise required by operable panel partition manufacturer's written installation instructions.
- B. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed.
- C. Install panels from marked packages in numbered sequence indicated on Shop Drawings.
- D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.
- E. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

3.3 ADJUSTING

- A. Adjust operable panel partitions to operate smoothly, without warping or binding. Lubricate hardware and other moving parts.
- B. Adjust storage pocket doors to operate smoothly and easily, without binding or warping. Check and readjust operating hardware. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.4 FIELD QUALITY CONTROL

- A. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and bottom seals for voids; adjust partitions for acceptable fit.

3.5 CLEANING

- A. Clean soiled surfaces of operable panel partitions to remove dust, loose fibers, fingerprints, adhesives, and other foreign materials according to manufacturer's written instructions.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

END OF SECTION 102226

SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Corner guards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For each type of wall and door protection showing locations and extent.

C. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:

1. Corner Guards: 12 inches long. Include example top caps.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type of exposed plastic material.

B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.5 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. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 48-inch- long units.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
2. Keep plastic materials out of direct sunlight.

3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
 - a. Store corner-guard covers in a vertical position.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E84 or UL 723; 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.

2.2 CORNER GUARDS

- A. Surface-Mounted, Metal Corner Guards (CGD-1): Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - a. InPro Corporation (Basis-of-Design).
 - 1) Product: Aluminum Corner Guard.
 - b. Construction Specialties, Inc.
 - c. Pawling Corporation.
 2. Material: Extruded aluminum, minimum 0.080 inch thick, with clear anodic finish.
 3. Wing Size: Nominal 3/4 by 3/4 inches.
 4. Mounting: Adhesive.

2.3 MATERIALS

- A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.
- B. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

2.4 FABRICATION

- A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.
- B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.5 FINISHES

- A. Protect 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 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 and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

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SECTION 102800 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Washroom accessories.
 - 2. Underlavatory guards.
 - 3. Custodial accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated on Drawings.
 - 2. Identify products using designations indicated on Drawings.
- C. Maintenance Data: For toilet accessories to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.4 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.5 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide Basis of Design products as scheduled, or comparable products approved by Architect, from one of the following:
 1. A & J Washroom Accessories, Inc.
 2. ASI; American Specialties, Inc.
 3. Bobrick Washroom Equipment, Inc.
 4. Bradley Corporation.
 5. Impact Products.
 6. Koala Kare Products; a division of Bobrick.
 7. Kimberly-Clark.
 8. McKinney/Parker Washroom Accessories Corp.

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- C. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- D. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- E. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.3 UNDERLAVATORY GUARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Plumberex Specialty Products, Inc.
 2. TCI Products.
 3. Truebro, Inc.
- B. Underlavatory Guard
 1. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without removing coverings.
 2. Material and Finish: Antimicrobial, molded-plastic, white.

2.4 FABRICATION

- A. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

- B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
- C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.
- D. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
 - 1. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.
- E. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
 - 1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - 2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- F. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

2.5 TOILET ACCESSORY SCHEDULE

Type	Description	Basis of Design Product
GB18	Grab Bar	Bobrick; B-5806x18
GB36	Grab Bar	Bobrick; B-5806x36
GB42	Grab Bar	Bobrick; B-5806x42
MR1	Mirror, 24" x 36"	Bobrick; B-165 2436
MR2	Full length mirror, 24" x 72"	Bobrick; B-165 2060
MOP	Mop Holder	Bobrick; B-224 x 36
SDU	Sanitary Disposal Unit	Impact; #1102 White
PTR	Paper Towel Dispenser	OFCI
RH	Robe Hook	Bobrick; B-542
SD	Liquid Soap Dispenser	OFCI
TT	Toilet Tissue Dispenser, Double Roll	OFCI
TTJ	Toilet Tissue Dispenser, Jumbo	OFCI
TTJ-C	Toilet Tissue Dispenser, Children	OFCI
DCS	Diaper Changing Station	Koala Kare KB300

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

- B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.
- C. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 104400 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Portable fire extinguishers.
 - 2. Fire protection cabinets for portable fire extinguishers
 - 3. Wall mounting brackets for fire extinguishers.

1.2 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FMG.
 - 2. Provide fire extinguishers in elevator mechanical/control rooms that comply with North Carolina Department of Labor requirements.

1.5 COORDINATION

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Amerex Corporation.
 2. Ansul Incorporated; Tyco International Ltd.
 3. Badger Fire Protection; a Kidde company.
 4. J.L. Industries, Inc.
 5. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
 6. Larsen's Manufacturing Company.
 7. Potter-Roemer; Div. of Smith Industries, Inc.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).
- C. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

2.3 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.
- B. Multipurpose Dry-Chemical Type: UL-rated 4-A:60-B:C, 10-lb nominal capacity, in enameled-steel container.
- C. Wet Chemical Type for Kitchen Areas: UL-rated 2-A:1-B:C:K, 2.5-gallon nominal capacity, with potassium acetate-based chemical in stainless-steel container; with pressure-indicating gage.

2.4 FIRE PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
- B. Cabinet Construction: Nonrated or to match adjacent wall construction.
- C. Cabinet Material: Steel sheet.
 1. Shelf: Same metal and finish as cabinet.
- D. Recessed Cabinet:
 1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
- E. Cabinet Trim Material: Steel sheet.

- F. Door Material: Steel sheet.
- G. Door Style: Vertical duo panel with frame.
- H. Door Glazing: Tempered float glass (clear).
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide projecting lever handle with cam-action latch.
 - 2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
 - 3. Provide manufacturer's standard hinge permitting door to open 180 degrees.
- J. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
 - a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Decals or Pressure-sensitive vinyl letters.
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.
- K. Finishes: Manufacturer's standard baked enamel or powder coat finish.
- L. Fabrication:
 - 1. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 - a. Weld joints and grind smooth.
 - b. Provide factory-drilled mounting holes.
 - 2. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
 - a. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 - b. Miter and weld perimeter door frames.

2.5 WALL MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

2.6 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning".
- B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets are to be installed.
- C. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged units.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for installing fire-protection specialties.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 - 1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
 - 2. Fasten mounting brackets to structure and cabinets, square and plumb.
 - 3. Fasten cabinets to structure, square and plumb.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust cabinet doors that do not swing or operate freely.
- B. Refinish or replace cabinets and doors damaged during installation.
- C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 104400

SECTION 105113 - METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Knocked-down wardrobe lockers.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

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 each type of metal locker.

B. Shop Drawings: For metal lockers.

1. Include plans, elevations, sections, and attachment details.
2. Show locker trim and accessories.
3. Include locker identification system and numbering sequence.

C. Samples for Verification: For the following products, in manufacturer's standard size:

1. Lockers and equipment.

D. Product Schedule: For lockers. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.6 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. The following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:

- a. Locks.
- b. Blank identification plates.

- c. Hooks.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.9 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: For lockers indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 KNOCKED-DOWN WARDROBE LOCKERS (ML)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design product indicated or a comparable product by one of the following:
 - 1. Art Metal Products (Basis-of-Design).
 - a. Product: Magnum Student KD Wardrobe Lockers.
 - 2. Hadrian.
 - 3. List Industries, Inc.
 - 4. Penco Products.
- B. Doors: One piece; fabricated from 0.080-inch (1.52-mm) nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
 - 1. Doors less than 12 inches wide may be fabricated from 0.048-inch nominal-thickness steel sheet.

2. Doors for box lockers less than 15 inches wide may be fabricated from 0.048-inch nominal-thickness steel sheet.
 3. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
 4. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.048-inch nominal-thickness steel sheet; welded to inner face of doors.
 5. Sound-Dampening Panels: Manufacturer's standard, designed to stiffen doors and reduce sound levels when doors are closed, of die-formed metal with full perimeter flange and sound-dampening material; welded to inner face of doors.
 6. Door Style: Unperforated panel.
- C. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. Tops, Bottoms, and Intermediate Dividers: 0.024-inch nominal thickness, with single bend at sides.
 2. Backs and Sides: 0.024-inch nominal thickness, with full-height, double-flanged connections.
 3. Shelves: 0.024-inch nominal thickness, with double bend at front and single bend at sides and back.
- D. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
- E. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
1. Hinges: Manufacturer's standard, steel, continuous or knuckle type.
- F. Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
- G. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.
- H. Hooks: Manufacturer's standard ball-pointed hooks, aluminum or steel; zinc plated.
- I. Coat Rods: Manufacturer's standard.
- J. Continuous Sloping Tops: Fabricated from manufacturer's standard thickness, but not less than 0.036-inch nominal-thickness steel sheet.
- K. Filler Panels: Fabricated from manufacturer's standard thickness, but not less than 0.036-inch nominal-thickness steel sheet.
- L. Materials:
1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
- M. Finish: Baked enamel or powder coat.
1. Color: As selected by Architect from manufacturer's full range.

2.3 LOCKS

- A. Combination Padlock: Key-controlled, three-number dialing combination locks; capable of five combination changes.
1. Provide extra padlocks equaling 5 percent of total amount.
 2. Provide 30 ADA-compliant locks; Basis-of-Design: Masterlock ADA Model 2650 Push Key.
 3. Provide Master key.

2.4 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
- D. Knocked-Down Construction: Fabricate metal lockers by preassembling at plant prior to shipping, using manufacturer's nuts, bolts, screws, or rivets.
- E. Accessible Lockers: Fabricate as follows:
1. Locate bottom shelf no lower than 15 inches above the floor.
 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.
- F. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
- G. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.
- H. Boxed End Panels: Fabricated with 1-inch- wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.
1. Provide one-piece panels for double-row (back-to-back) locker ends.
 2. Provide screw hole caps of all end units.

2.5 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine walls and floors or support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. 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

- A. Install lockers level, plumb, and true; shim as required, using concealed shims.
 - 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 - 2. Anchor single rows of metal lockers to walls near top of lockers and to floor.
 - 3. Anchor back-to-back metal lockers to floor.
- B. Knocked-Down Lockers: Assemble with manufacturer's standard fasteners, with no exposed fasteners on door faces or face frames.
- C. Equipment:
 - 1. Attach hooks with at least two fasteners.
 - 2. Attach door locks on doors using security-type fasteners.
 - 3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
 - b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.
- D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 1. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
 - 2. Attach sloping-top units to metal lockers, with closures at exposed ends.
 - 3. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 105613 - STORAGE SHELVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid plastic (HDPE) storage shelving.
2. Four-post metal storage shelving.
3. Post-and-beam metal storage shelving.
4. Wire shelving units.

1.2 COORDINATION

- A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall assemblies.
- B. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.

B. Shop Drawings: For metal storage shelving.

1. Include plans, elevations, sections, and attachment details.
2. Include installation details of connectors, lateral bracing, and special bracing.

C. Samples for Verification: For the following components, of size indicated below:

1. Vertical Supports: 12 inches tall.
2. Shelves: Full size, but not more than 24 inches wide by 12 inches deep.
3. Connectors: Full size.
4. Shelf-Label Holders: Full size.

D. Product Schedule: For metal storage shelving. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For seismic restraint of metal storage shelving.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of metal storage shelving.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal storage shelving to include in maintenance manuals.

1.6 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. Shelves: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 5 shelves.
 - 2. Shelf-to-Post Connectors: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 10 connectors.
 - 3. Casters: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 5 casters.
 - 4. Shelf-Label Holders: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 10 holders.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install metal storage shelving until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal storage shelving, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

2.2 FOUR-POST METAL STORAGE SHELVING

- A. Open Four-Post Metal Storage Shelving: Complying with MH 28.1 and field assembled from factory-formed components. Shelves span between supporting corner posts that allow shelf-height adjustment over full height of shelving unit. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories indicated.

1. Basis-of-Design Products: Subject to compliance with requirements, provide the Basis-of-Design products indicated or comparable products by one of the following:
 - a. Structural Plastics Corp. (SPC) (Basis-of-Design).
 - b. Metro Shelving; InterMetro Industries Corp. (Basis-of-Design).
 - c. ULINE (Basis-of-Design).
 - d. Bradford Systems.
 - e. Eagle Group.
 - f. RTI Shelving Systems.
 - g. Tennsco.

Designation	Basis-of-Design	Shelf Capacity (lbs)	Shelf Material
SH-1	SPC; Durashelf AST3624x4	1,320	Solid HDPE
SH-2	SPC; DuraShelf AST4824x4	1,760	Solid HDPE
SH-3	Metro; MetroMax X336EFX3	900	Solid polymer
SH-4	ULINE; H-1388	1,400	Particleboard
SH-5	ULINE; H-1390	1,000	Particleboard
SH-6	ULINE; H-3589	460	Vented HDPE
SH-7	ULINE; H-3841	800	Steel
SH-8	ULINE; H-3354	800	Steel
SH-9	ULINE; H-6148	800	Stainless Steel Wire
SH-10	ULINE; H-5520	300	Particleboard
SH-11	ULINE; H-5521	300	Particleboard
SH-12	ULINE; H-5188	300	Particleboard
SH-13	ULINE; H-5436	250	Chrome Wire

2. Steel Posts: Fabricated from hot-rolled steel; in manufacturer's standard shape; with perforations at 1-1/2 inches o.c. to receive shelf-to-post connectors.
 - a. Unit Configuration: Configure shelving units as individual, freestanding assemblies.
3. HDPE Posts: Fabricated from high-density polyethylene (HDPE), notched in 4-inch increments for adjustability.
4. Bracing: Manufacturer's standard, double diagonal cross bracing.
 - a. Location: At unit back and ends as required for stability, load-carrying capacity of shelves, and number of shelves indicated.
5. Solid-Type Shelves:
 - a. Steel Sheet: Nominal thickness as required for load-carrying capacity per shelf.
 - b. Particleboard Shelves: 5/8 inch (16 mm) thick; factory cut.
 - c. HDPE Shelves: 2-5/8 inch thick high-density polyethylene (HDPE).
 - d. Fabricate fronts and backs of shelves with box-formed edges, with corners lapped and welded.
 - e. Fabricate fronts and backs of shelves with vertical edges that are flanged and returned, with edges reinforced with steel bars, angles, or channels.

6. Framed-Type Wire Shelves: Steel wire; with shelf frame fabricated from same material and with same finish as posts.
7. Shelf Quantity: As indicated on Equipment Schedule, in addition to top and bottom shelf.
8. Overall Dimensions: As indicated on Equipment Schedule on Drawings.
9. Accessories:
 - a. Casters: Manufacturer's polyurethane swivel stem casters and casters with brakes.
 - b. Shelf-Label Holders: Clear plastic, designed to clip onto front edge of shelf.
10. Steel Finish: Powder coat or chrome.
 - a. Power Coat Color and Gloss: As selected by Architect from manufacturer's full range.
11. Stainless-Steel Finish: Manufacturer's standard nondirectional-polish finish.

2.3 ANCHORS

- A. Wall Anchors: Manufacturer's standard, galvanized-steel anchors designed to secure metal storage shelving to adjacent wall. Provide one per shelving unit for each shelving unit adjacent to a wall unless additional anchors are indicated in calculations.

2.4 FABRICATION

- A. Fabricate metal storage shelving components to provide field-assembled units that are square and rigid, with posts plumb and true and shelves flat and free of dents or distortion. Fabricate connections to form a rigid structure, free of buckling and warping.
 1. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
 2. Build in straps, plates, brackets, and other reinforcements as needed to support shelf loading.
 3. Cut, reinforce, drill, and tap metal fabrications to receive hardware, fasteners, and similar items.

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. Examine floors for suitable conditions where metal storage shelving will be installed.
- C. Examine walls to which metal storage shelving will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.

- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum and clean finished floor over which metal storage shelving is to be installed.

3.3 INSTALLATION

- A. Install storage shelving level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping.
 - 1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 - 2. Install braces, straps, plates, brackets, and other reinforcements as needed to support shelf loading and as required for stability.
 - 3. Adjust post-base bolt leveler to achieve level and plumb installation.
 - 4. Anchor shelving units to floor with floor anchors through floor plate. Shim floor plate to achieve level and plumb installation.
 - 5. Install shelves in each shelving unit at equal spacing.
 - a. Four-Post Storage Shelving: Install four clips, one at each post, for support of each shelf; with clips fully engaged in post perforations.
 - b. Post-and-Beam Storage Shelving: Install beams with beam-to-post connectors fully engaged in post perforations.
- B. Accessories:
 - 1. Shelf-Label Holders: Install one on each shelf.
 - a. Install at locations indicated on Drawings within each shelving unit.
 - 2. Casters: Install casters to shelving unit indicated on Drawings. Each shelving unit to receive two (2) swivel stem casters and two (2) swivel stem casters with brakes.

3.4 ERECTION TOLERANCES

- A. Erect four-post metal storage shelving to a maximum tolerance from vertical of 1/2 inch in up to 10 feet of height, not exceeding 1 inch for heights taller than 10 feet.
- B. Erect post-and-beam metal storage shelving to a maximum tolerance from vertical of 1/4 inch in 84 inches of height.

3.5 ADJUSTING

- A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.

- B. Adjust and lubricate operable components to operate smoothly and easily, without binding or warping. Check and readjust operating hardware.
- C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.
- D. Replace metal storage shelving components that have been damaged beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 105619

SECTION 107326 - MANUFACTURED WALKWAY COVERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes post-and-beam supported walkway covers.

1.2 ALTERNATES

- A. The Work of this Section is affected by an Alternate. Refer to Section 012300 "Alternates."

1.3 SYSTEM DESCRIPTIONS

- A. General: Provide a complete, integrated set of walkway covers, in types indicated, of manufacturer's standard mutually dependent components and assemblies that form a walkway cover system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into protected or interior spaces. Include primary and secondary framing, metal roof panels, and accessories complying with requirements indicated.
 - 1. Provide walkway cover system of size and spacings, slopes, and spans indicated.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details for each type of walkway covers.
 - 1. Include plans, elevations, and at least 3/4-scale sections of typical members and other components. Show anchors, reinforcement, accessories, layout, and installation details.
 - 2. Include diagrams for power, signal, and control wiring.
- C. Samples for Verification: For each type of product indicated, of size below:
 - 1. Aluminum: For each form, finish, and color, on 6-inch- long sections of extrusions and squares of sheet at least 4 by 4 inches.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's warranty.
- B. Welding certificates.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For manufactured walkway covers to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation of units required for this Project.

- B. Source Limitations: Obtain walkway covers and components through one source from a single manufacturer.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined by NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver walkway covers in protective covering and packaging to protect components and surfaces against damage.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with walkway covers by field measurements and indicate on Shop Drawings.

1.10 COORDINATION

- A. Coordinate installation of anchorages for walkway covers. Furnish setting drawings, templates, and directions for installing anchorages and other items that are to be embedded in concrete. Deliver such items to Project site in time for installation.
- B. Coordinate delivery time so walkway cover systems can be installed within 24 hours of receipt at Project site.

1.11 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace manufactured walkway covers and components that fail(s) in materials, finish, and workmanship within specified warranty period.
 - 1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide walkway covers capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Design Loads: As indicated on Drawings.
 - 2. Snow Loads: As indicated on Drawings.
 - 3. Deflection Limits: Engineer assemblies to withstand design loads with deflections no greater than the following:
 - a. Purlins and Rafters: Vertical deflection of $L/180$ of the span.
 - b. Metal Roof Panels: Vertical deflection of $L/180$ of the span.
- B. Seismic Performance: Design and engineer walkway cover systems capable of withstanding the effects of earthquake motions determined according to ASCE 7.

- C. Thermal Movements: Provide walkway covers 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.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

- A. Basis-of-Design: Subject to compliance with requirements, provide Peachtree Protective Covers or comparable products by one of the following:
1. Dittmer Architectural Metals (Basis-of-Design).
 2. Mapes Industries.
 3. Peachtree Protective Covers.
 4. Superior Metal.

2.3 MATERIALS

- A. Aluminum Sheet and Plate: ASMT B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of alloy 3003-H14, 0.040 inch minimum thickness.
- B. Aluminum Extrusions: Alloy 6063, T6 temper, ASTM B 221.
1. Thickness: As required by design, complying with minimum thickness requirements specified.
- C. Threaded Rod: ASTM A 36/A 36M. Hot-dipped zinc coating, ASTM A 153/A 153M, Class C.

2.4 POST-AND-BEAM SUPPORTED WALKWAY COVERS

- A. Basis-of-Design Product: Dittmer Architectural Metal; Ditt-Deck.
1. Deck: Extruded aluminum; corrugated; 6 inches by 3 inches.
 - a. Thickness: 0.060 inch.
 - b. Interlocking to create monolithic structural unit.
 2. Columns: Radius-cornered tubular extrusions with cutout and internal diverter for drainage where indicated.
 - a. Dimensions: 6 inches by 6 inches.
 3. Beams: Provide open-top tubular extrusion, top edges thickened for strength and designed to receive deck members in self-flashing manner.
 - a. Dimensions: 6 inches by 6 inches.
 4. Fascia: Manufacturer's standard shape; provide fascia splices at joints.
 5. Color and Finish: Custom color to match building metal panels as selected by Architect.

2.5 ACCESSORIES

- A. Fasteners: Use concealed fasteners fabricated from metals that are noncorrosive to walkway cover systems material and mounting surface.
- B. Anchors and Inserts: Use stainless-steel or hot-dip galvanized anchors and inserts. Use torque-controlled expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete.

- C. Concrete for Foundations: Comply with requirements in Section 033000 "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.

2.6 FABRICATION

- A. General: Provide walkway cover systems consisting of extruded aluminum canopy supported on aluminum structural framing system, wall-hung and post supported, as indicated.
- B. Shop assemble manufactured walkway covers 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. Bent Construction: Factory assemble beams to columns to form one-piece rigid bents. Where used make welds smooth and uniform using an inert gas shielded arc. Perform suitable edge preparation to assure 100% penetration. Grind welds only where interfering with adjoining structure to allow for flush connection. Field welding is not permitted. Rigid mechanical joints can be used if supported by engineering calculations and/or testing.
- D. Deck Construction: Fabricate from extruded modules that interlock in a self-flashing manner. Positively fasten interlocking joints creating a monolithic structural unit capable of developing the full strengths of the sections. The fastenings must have minimum shear strength of 350 lbs. each. Assemble deck with sufficient camber to offset dead load deflection.
- E. Columns: Provide radius-cornered tubular extrusions with cutout and internal diverter for drainage where indicated. Downspouts are not acceptable.
- F. Beams: Provide open-top tubular extrusion, top edges thickened for strength and designed to receive deck members in self-flashing manner.
- G. Deck: Extruded self-flashing sections interlocking onto a composite unit. Provide welded plate closures at deck ends.
- H. Fascia: Manufacturer's standard shape. Provide fascia splices where continuous runs of fascia are jointed. Locate splices to be in line with bents and fasten in place on hidden or non-vertical surfaces.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install walkway covers in strict accordance with manufacturer's written recommendations and approved Shop Drawings.
- B. Excavation: In firm, undisturbed or compacted soil, excavate walkway cover systems foundation to dimensions indicated.
- C. Set anchor bolts and other embedded items required for installation of walkway cover systems. Use templates furnished by suppliers of items to be attached.
- D. Install walkway cover systems level, plumb, and at height and slope indicated, with surfaces free from distortion or other defects in appearance.

1. Beams:
 - a. If mechanically fastened system, place beams in column notches and secure with proper number of fasteners as specified by size of beam and engineering. Ensure contact bearing in bottom of column notches; insert aluminum shim plates as necessary.
 - b. Level tops of beams to receive roof panels; roof panels shall drain rainwater into beams as indicated.
 - c. Minor connections and incidental details shall be as shown on the drawings.
 - d. Ensure that end caps are welded or mechanically fastened securely into place.
2. Roof Panels:
 - a. Fabricate roof panels to required lengths.
 - b. Install level and square to beams to avoid "out of square" conditions at beam ends.
 - c. Secure each contact point with a minimum of three stainless steel fasteners with 3/4 inch flat neoprene washers or other manufacturer tested and approved system.
3. Joint Sealants and Flashing:
 - a. Seal fabrication joints and seams away from view where required.
 - b. Seal all other points where water penetration might be expected.
 - c. Properly flash connection to walls where walkway cover units contact surface of building. Note: Sealants are not acceptable for closure/flushing between building and walkway cover system.

3.2 CLEANING AND PROTECTION

- A. At completion of installation, clean soiled surfaces of walkway cover systems according to manufacturer's written instructions.
 1. Remove protective film from members. Clean canopy of dirt, grease, handprints, and other blemishes. Leave area in a neat, clean, and acceptable condition.
- B. Protect canopy from damage from other construction operations. Provide temporary barricades where necessary.

END OF SECTION 107326

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SECTION 107516 - GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes ground-set flagpoles made from aluminum with components as needed for complete installation.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.
- B. Shop Drawings: For each flagpole.
 - 1. Include the following
 - a. Plans, elevations, and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
 - b. Section, and details of foundation system.
- C. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. General: Spiral wrap flagpoles with a heavy Kraft paper or other lightweight wrapping and enclose in a hard fiber tube or other protective means. Store bare flagpoles in a dry location, protected from the weather and moisture, as recommended by the manufacturer.
- B. Shipping: Ship to project site in one piece or as specified. If more than one piece is necessary, provide snug fitting precision joints with self-aligning, internal splicing sleeve arrangements for weather tight, hairline field joints.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer, subject to compliance with requirements.

1. Basis of Design – Liberty Flagpoles
2. Approved Equal

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Flagpole assemblies, including anchorages and supports, capable of withstanding design loads indicated within limits and under conditions indicated.
1. Wind Loads: as determined according to NAAMM FP 1001-07, "Guide Specifications for Design of Metal Flagpoles".
 2. Flagpole Design: Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole.

2.3 ALUMINUM FLAGPOLES

- A. Aluminum Flagpoles: Entasis-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.
- B. Assembly Construction: External Single Revolving – Rope Halyard – Ground Set Foundation.
- C. Exposed Height: 30 feet
- D. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
1. Fabricate shop and field joints without using fasteners, screw collars, or lead caulking.
 2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
- E. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, 0.060-inch wall thickness with 3/16-inch steel bottom plate and support plate; 3/4-inch- diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.
1. Flashing Collar: Same material and finish as flagpole.
- F. Sleeve for Aluminum Flagpole: Fiberglass or PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.
1. Flashing Collar: Same material and finish as flagpole.
- G. Cast-Metal Shoe Base: Made from aluminum with same finish and color as flagpoles for anchor-bolt mounting; furnish with anchor bolts.
1. Furnish ground spike.
- H. Hinged Baseplate: Cast-metal tilting hinged base and anchor plate joined by permanently secured pivot rod. Furnish with stainless steel screws for securing tilting base to anchor plate when not tilted; furnish with anchor bolts.
1. Finish: Same as flagpole.
 2. Furnish aluminum base or aluminum flashing collar finished to match flagpole.
 3. Furnish ground spike.

- I. Pivoting Tilt Base: Steel baseplate with channel or rectangular tube uprights, pivot bolt, and locking device for tilting flagpole. Furnish tilting flagpole with steel counterweight box and weights, or furnish with internal counterweight. Furnish base with anchor bolts.
 - 1. Finish: Same as flagpole.
 - 2. Furnish ground spike.

2.4 FITTINGS

- A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
 - 1. 0.063-inch spun aluminum, finished to match flagpole with gold anodic finish.
- B. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous 5/16-inch-diameter, braided polypropylene halyard and 9-inch cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.
 - 1. Halyards and Cleats: [One] [Two] at each flagpole.
 - 2. Cleat Covers: Cast metal, finished to match flagpole, secured with cylinder locks.
 - 3. Halyard Covers: 2-inch channel, 60 inches long, finished to match flagpole.
 - 4. Halyard Flag Snaps: Stainless steel swivel snap hooks with neoprene or vinyl covers. Furnish two per halyard.
 - 5. Plastic Halyard Flag Clips for External Halyard, Ball-Bearing System: Made from injection-molded, UV-stabilized, acetal resin (Delrin). Clips attach to flag and have two eyes for inserting both runs of halyards. Furnish two per halyard.

2.5 MISCELLANEOUS MATERIALS

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.
- B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.
- C. Sand: ASTM C33/C33M, fine aggregate.
- D. Elastomeric Joint Sealant: Multicomponent nonsag urethane joint sealant complying with requirements in Section 079200 "Joint Sealants."
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, [AA-M12C22A41] [AA-M12C22A31].

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

- B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.
- C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.
- D. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.
- E. Sleeves: Locate and secure sleeves in forms by bracing to reinforcement and forms.
- F. General: Install flagpoles where indicated and according to[Shop Drawings and] manufacturer's written instructions.
- G. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.
- H. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

END OF SECTION 107516

SECTION 109000 – MISCELLANEOUS SPECIALTIES**PART 1 - GENERAL****1.1 SUMMARY**

A. Section includes miscellaneous specialties items including the following:

1. Clocks.
2. Clock guards.
3. Projectors.
4. Wall hooks.

B. Related Information:

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For miscellaneous specialties items to include in operation and maintenance manuals.

PART 2 - PRODUCTS**2.1 CLOCKS**

A. Wall Clock (WC-1 and WC-2): Standard full number analog dial with black numbers on white background, molded lens, sweep second hand.

1. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - a. Telecor (Basis-of-Design).
 - 1) Products: As indicated on Equipment Schedule on Drawings.
 - b. American Time.
 - c. School Outfitters.
 - d. Shiffler Equipment.
 - e. Visiplex, Inc.
2. Battery operation.
3. Concealed mounting brackets.
4. Color: As selected by Architect from manufacturer's standard colors.

2.2 CLOCK GUARDS

A. Clock Guards (WC-3): Hinged hexagon-shaped clock guard fabricated from heavy-gauge steel wire and polycarbonate for use with round-faced wall clocks.

1. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - a. American Time (Basis-of-Design).
 - 1) Product: Model #1800.
 - b. Recreonics.
 - c. Robert Brooke & Associates.

2.3 PROJECTORS

- A. Projectors (PJ): Provide LCD laser projector with USB connector; ceiling mounted.

1. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - a. Panasonic (Basis-of-Design).
 - 1) Product: Model #PT-MZ680.
 - b. Epson.
 - c. JVC.
2. Aspect Ratio: 16:10.
3. Pixels: 1920 x 1200.
4. Light Source: Laser diodes.
5. Power Supply: 100-240 V, 50/60 Hz.
6. Cabinet Material: Molded plastic.

2.4 WALL HOOKS

- A. Wall Hook (WH-1): Stainless steel mounting strip with 3 hooks.

1. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - a. Bobrick Washroom Accessories (Basis-of-Design).
 - 1) Product: Model B-232x24.
 - b. Bradley Corporation.
 - c. Global Industries.
 - d. ULINE.
2. Mounting: Surface mounted on wall.
3. Dimensions: As indicated on Equipment Schedule on Drawings.
4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

- B. Wall Hook (WH-2): Large metal J-hook with vinyl coating.

1. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - a. Husky (Basis-of-Design).
 - b. Global Industries.
 - c. ULINE.
2. Capacity: 45 lbs.
3. Mounting: Surface mounted on wall.
4. Dimensions: As indicated on Equipment Schedule on Drawings.
5. Material: Steel with vinyl coating.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine substrates for suitability for installation of miscellaneous specialties. Do not proceed with installation until substrates and surroundings comply with manufacturer's written instructions.

3.2 INSTALLATION

- A. General: Install miscellaneous specialties where shown and according to manufacturer's written instructions.
- B. Adjust and clean miscellaneous specialties; leave in working condition, ready for use.
- C. Instruct owner's personnel on use and maintenance of miscellaneous specialties.

END OF SECTION 109000

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SECTION 111313 - LOADING DOCK BUMPERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes loading dock bumpers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of loading dock bumper.
- B. Shop Drawings: For dock bumpers. Include plans, elevations, sections, details, and attachments to other work.

PART 2 - PRODUCTS

2.1 DOCK BUMPERS

- A. General: Surface-mounted bumpers; of type, size, and construction indicated; designed to absorb kinetic energy and minimize damage to loading dock structure.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Kelley; 4Front Engineered Solutions, Inc.
 - b. Pioneer Dock Equipment.
 - c. Rite-Hite Corporation.
- B. Laminated-Tread Dock Bumper: Fabricated from multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than 2-3/4 inches diameter, steel supporting rods that are welded at one end to 1/4-inch thick, structural steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than 1 inch of tread plies extending beyond the face of closure.
 - 1. Thickness: 7-1/2 inches thick.
 - 2. Configuration: Horizontal style; 10 inches high by 24 inches wide.
- C. Anchorage Devices: Galvanized-steel anchor bolts, nuts, washers, bolts, sleeves, cast-in-place plates, and other anchorage devices as required to fasten bumpers securely in place and to suit installation type indicated. Hot-dip galvanized according to ASTM A 153/A 153M or ASTM F 2329.
- D. Materials: ASTM 36/A 36M for steel plates, shapes, and bars. Hot-dip galvanize according to ASTM A 123/A 123M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, 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

- A. Dock Bumpers: Attach dock bumpers to face of loading dock in a manner that complies with requirements indicated for spacing, arrangement, and position relative to top of platform and anchorage.
1. Welded Attachment: Plug-weld anchor holes in contact with steel inserts and fillet weld at other locations.
 2. Bolted Attachment: Attach dock bumpers to preset anchor bolts embedded in concrete or to cast-in-place inserts or threaded studs welded to embedded-steel plates or angles. If preset anchor bolts, cast-in-place inserts, or threaded studs welded to embedded-steel plates or angles are not provided, attach dock bumpers by drilling and anchoring with expansion anchors and bolts.
 3. Screw Attachment: Attach dock bumpers to wood construction with lag bolts as indicated.

3.3 ADJUSTING

- A. After completing installation of exposed, factory-finished dock bumpers, inspect exposed finishes and repair damaged finishes.

END OF SECTION 111313

SECTION 113100 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cooking appliances.
 - 2. Ventilation range hoods.
 - 3. Refrigeration appliances.
 - 4. Cleaning appliances.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard size.
- C. Product Schedule: For appliances. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of appliance.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturers' special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.6 WARRANTY

- A. Refrigerator/Freezer Icemaker, Sealed System: Full warranty, including parts and labor, for on-site service on the product.

1. Warranty Period for Sealed Refrigeration System: Five years from date of Substantial Completion.
 2. Warranty Period for Other Components: One year from date of Substantial Completion.
- B. Dishwasher: Full warranty, including parts and labor, for on-site service on the product.
1. Warranty Period for Deterioration of Tub and Metal Door Liner: Five years from date of Substantial Completion.
 2. Warranty Period for Other Components: Two years from date of Substantial Completion.
- C. Clothes Washer: Full warranty, including parts and labor, for on-site service on the product.
1. Warranty Period for Motor: 10 years from date of Substantial Completion.
 2. Warranty Period for Other Components: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain residential appliances from single source and each type of residential appliance from single manufacturer.
- B. Manufacturers: Subject to compliance with requirements, provide the Basis-of-Design products indicated or comparable products by one of the following:
1. Broan-NuTone, LLC.
 2. Electrolux Home Products (Frigidaire).
 3. General Electric Company (GE Appliances).
 4. KitchenAid; a division of Whirlpool Corporation.
 5. Maytag; a division of Whirlpool Corporation.
 6. Summit Appliances.
 7. Whirlpool Corporation.

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Accessibility: Comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

2.3 RANGES

- A. Electric Range (RA): Freestanding range with one oven(s) and complying with AHAM ER-1. ADA compliant.
1. Basis-of-Design: GE; Model #JB480SMSS Free-Standing Electric Radiant Smooth Cooktop Range.
 2. Width: 30 inches.
 3. Electric Burner Elements: Four.
 - a. Radiant Type: Manufacturer's standard.
 - b. Controls: Panel controls located on front.
 4. Oven Features:

- a. Operation: Baking, self-cleaning.
 - b. Electric Power Rating: Manufacturer's standard.
 - c. Controls: Panel controls and timer display, located on front.
5. Anti-Tip Device: Manufacturer's standard.
 6. Material: Stainless steel with ceramic-glass cooktop.

2.4 VENTILATION EXHAUST HOOD

A. Exhaust Hood (HD): ADA compliant.

1. Basis-of-Design: Broad NuTone; Model #BCSD130SS Glacier Under-Cabinet Range Hood.
2. Type: 30-inch, undercabinet range hood.
3. Exhaust Fan: Two-speed fan, built-in hood.
4. Fan Control: Wall-mounted, multiposition fan switch, with separate hood-light control switch or remote control for ADA compliance
5. Duct Type: 3-1/4 by 10 inches.
6. Finish: Stainless steel.
7. Standard features include the following:
 - a. Permanent, washable aluminum mesh filter(s).
 - b. Built-in lighting.
8. Weatherproof cap with back draft damper and rodent-proof screening.

2.5 REFRIGERATOR/FREEZERS

A. Refrigerator/Freezer (RF-1): Two-door refrigerator/freezer with freezer on bottom and complying with AHAM HRF-1.

1. Basis-of-Design: GE; Model #PYE22KYNFS Profile Counter-Depth French-Door Refrigerator.
2. Type: Freestanding.
3. Dimensions:
 - a. Width: 35-3/4 inches.
 - b. Depth: 31-1/4 inches.
 - c. Height: 69-7/8 inches
 - d. Storage Capacity:
 - 1) Refrigeration Compartment Volume: 14.92 cu. ft.
 - 2) Freezer Volume: 7.16 cu. ft.
 - e. Shelf Area: 5 glass shelves.
 - 1) 4 split adjustable; 1 full-width.
 - 2) 3 spill-proof.
4. General Features:
 - a. Door Configuration: Overlay.
 - b. Dispenser in door for ice and cold water with dispenser lock.
 - c. Built-in water-filtration system.
5. Freezer Features: One freezer compartment(s) with door(s).
 - a. Automatic defrost.
 - b. Automatic icemaker and storage bin.
6. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
7. Front Panel(s): Stainless steel.

8. Appliance Color/Finish: Stainless steel.

B. Refrigerator/Freezer (RF-2): Two-door refrigerator/freezer with freezer on bottom and complying with AHAM HRF-1. ADA compliant.

1. Basis-of-Design: GE; Model #GNE25JYKFS French-Door Refrigerator.
2. Type: Freestanding.
3. Dimensions:
 - a. Width: 32-3/4 inches.
 - b. Depth: 37-1/2 inches.
 - c. Height: 69-7/8 inches
 - d. Storage Capacity:
 - 1) Refrigeration Compartment Volume: 17.43 cu. ft.
 - 2) Freezer Volume: 7.26 cu. ft.
 - e. Shelf Area: Five adjustable glass shelves.
4. General Features:
 - a. Door Configuration: Overlay.
 - b. Built-in water-filtration system.
5. Freezer Features: One freezer compartment(s) with door(s).
 - a. Automatic defrost.
 - b. Automatic icemaker and storage bin.
6. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
7. Front Panel(s): Stainless steel.
8. Appliance Color/Finish: Stainless steel.

C. Refrigerator/Freezer (UR): Undercounter refrigerator; ADA compliant.

1. Basis-of-Design: Summit Appliances; Model #AL752BKSSHH All-Refrigerator, ADA Compliant.
2. Type: Undercounter.
3. Dimensions:
 - a. Width: 23.63 inches.
 - b. Depth: 23.50 inches.
 - c. Height: 32 inches.
4. Storage Capacity: 5.3 cu. ft.
5. Shelves: 3 adjustable glass shelves.
6. Security Feature: Manufacturer's standard door lock.
7. ADA compliant.
8. Appliance Color/Finish: Stainless steel.

2.6 DISHWASHERS

A. Dishwasher (DW): Complying with AHAM DW-1. ADA compliant.

1. Basis-of-Design: GE; Model #GDT226SSLSS ADA Compliant Stainless-Steel Dishwasher.
2. Type: Built-in undercounter.
3. Dimensions:
 - a. Width: 23-3/4 inches.
 - b. Depth: 23-1/2 inches.

- c. Height: 32-1/4 inches.
4. Capacity:
 - a. International Place Settings of China: Up to 12.
 - b. Water Consumption for Full Load: 3.2 gal. per cycle.
5. Sound Level: Maximum 51 dB.
6. Tub and Door Liner: Stainless steel with sealed detergent and automatic rinsing-aid dispensers.
7. Rack System: Nylon or PVC-coated sliding dish racks, with removable cutlery basket.
8. Controls: Touch-pad controls with four wash cycles and hot-air and heat-off drying cycle options.
9. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
10. Front Panel: Stainless steel.
11. Appliance Color/Finish: Stainless steel.

2.7 CLOTHES WASHERS AND DRYERS

A. Clothes Washer (WM-1): Complying with ASSE 1007. ADA compliant.

1. Basis-of-Design: GE; Model #GFW850SSNWW; Front Load Steam Washer with SmartDispense UltraFresh Vent System with OdorBlock and Sanitize + Allergen.
2. Type: Freestanding, front-loading unit.
3. Dimensions:
 - a. Width: 28 inches.
 - b. Depth: 34 inches.
 - c. Height: 39-3/4 inches.
4. Drum: Perforated stainless steel.
 - a. Capacity: 5.0 cu. ft.
5. Controls: Rotary-dial controls for water-fill levels, wash/rinse water temperatures, and variable-speed and fabric selectors.
 - a. Wash Cycles: 12 wash cycles including regular, delicate, and permanent press.
 - b. Wash Temperatures: Five settings.
 - c. Speed Combinations: Five.
6. Electrical Power: 120 V, 60 Hz, 1 phase, 15 A.
7. Motor: Manufacturer's standard with built-in overload protector.
8. Pedestal: Manufacturer's standard height laundry pedestal with storage drawer, matching appliance finish.
9. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
10. Appliance Finish: Porcelain enamel on top and lid; baked enamel on front and sides.
 - a. Color: White.

B. Clothes Washer (WM-2): Complying with AHAM HLW-1.

1. Basis-of-Design: GE; Model #PTW600BSRWS Washer with Smarter Wash Technology and FlexDefense.
2. Type: Freestanding, top-loading unit.
3. Dimensions:
 - a. Width: 27-7/8 inches.
 - b. Depth: 28 inches.
 - c. Height: 43-7/8 inches.

4. Drum: Perforated stainless steel.
 - a. Capacity: 5.0 cu. ft.
 5. Controls: Touch-pad controls for water-fill levels, wash/rinse water temperatures, and variable-speed and fabric selectors.
 - a. Wash Cycles: Three wash cycles, including regular, delicate, and permanent press.
 - b. Wash Temperatures: Six settings.
 - c. Speed Combinations: Five.
 6. Electrical Power: 120 V, 60 Hz, 1 phase, 10 A.
 7. Motor: Manufacturer's standard with built-in overload protector.
 8. Energy Star: Provide appliances that qualify for the EPA/DOE Energy Star product-labeling program.
 9. Water-Efficient Clothes Washer: Provide clothes washer with modified energy factor greater than or equal to 2.0 and water factor less than 5.5.
 10. Appliance Finish: Enamel.
 - a. Color: White.
- C. Clothes Dryer (CD-1): ADA compliant.
1. Basis-of-Design: GE; Model #GFD55ESSNWW Front Load Electric Dryer with Sanitize Cycle.
 2. Type: Freestanding, frontloading, electric unit.
 3. Dimensions:
 - a. Width: 28 inches.
 - b. Depth: 32 inches.
 - c. Height: 39-3/4 inches.
 4. Drum: Perforated aluminum.
 - a. Capacity: 7.8 cu. ft.
 5. Controls: Rotary-dial controls for drying cycle, temperatures, and fabric selectors.
 6. Electric-Dryer Power: 120V/240 V, 60 Hz, 24 A.
 7. Pedestal: Manufacturer's standard height laundry pedestal with storage drawer, matching appliance finish.
 8. Appliance Finish: Porcelain enamel on top and lid; baked enamel on front and sides.
 - a. Color: White.
- D. Clothes Dryer (CD-2): Complying with AHAM HLD-1.
1. Basis-of-Design: GE; Model #PTD60EBSRWS
 2. Type: Freestanding, frontloading, electric unit.
 3. Dimensions:
 - a. Width: 27 inches.
 - b. Depth: 31 inches.
 - c. Height: 43-7/8 inches.
 4. Drum: Aluminized alloy.
 - a. Capacity: 7.4 cu. ft..
 5. Controls: Touch-pad controls for drying cycle, temperatures, and fabric selectors.
 6. Electric-Dryer Power: 240 V, 60 Hz, 1 phase, 60 A.
 7. Appliance Finish: Enamel.
 - a. Color: White.

2.8 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical 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 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, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Examine walls, ceilings, and roofs for suitable conditions where will be installed.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install appliances according to manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

3.3 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's staff and maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION 113100

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SECTION 114000 - FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the contract including general and supplementary conditions and general requirements apply to the work specified in this section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Plumbing: Refer to Division 22, including:
 - 1. Rough-in piping for gas and water supply and waste lines.
 - 2. Piping for supply and waste lines.
 - 3. Traps, grease traps, line strainers, tail pieces, valves, stops, shut-offs and miscellaneous fittings required for complete installation.
 - 4. Final connections.
 - 5. Indirect drains for sink compartments.
- B. Mechanical: Refer to Division 23, including:
 - 1. Roof mounted fans and connecting ductwork not shown as part of the kitchen equipment.
 - 2. Final connections, including approved welded duct connections to hoods.
- C. Electrical: Refer to Division 26, including:
 - 1. Rough-in conduit, wiring, line and disconnect switches, safety cut-offs and fittings, control panels, fuses, boxes and fittings required for complete installation.
 - 2. Final connections, including mounting and wiring of switches furnished as part of the food service equipment (unless otherwise indicated on the drawings).

1.3 WORK INCLUDED THIS SECTION:

- A. Furnish and install all food service equipment as specified herein, including that which is reasonably inferred, with all related items necessary to complete work shown on contract drawings and/or required by these specifications.
- B. Electrical Work:
 - 1. Interwiring of food service equipment between components within equipment, such as heating elements, switches, thermostats, motors, etc., complete with junction box as is applicable, ready for final connection.
 - 2. Voltages shall be as indicated on contract drawings. Any differences in electrical characteristics at job site from those shown on contract documents must be submitted to Architect for consideration prior to ordering equipment.
- C. Plumbing Work:
 - 1. Furnish all equipment with faucets, sink waste assemblies, and trim as specified in this section.

2. Other than sink compartments, extend all indirect waste lines to nearest floor receptor. All such drain lines to be properly sized. Drain shall terminate with proper air gap above flood rim of floor receptor. Drain lines to be copper with silver paint unless specified otherwise. Drain lines in public areas to be chrome plated where exposed to view.

1.4 QUALITY ASSURANCE

- A. It is required that all custom fabricated equipment such as food serving units, tables, sinks, counter tops, etc., be manufactured by a food service equipment fabricator who has the plant, personnel and engineering equipment required. Such manufacturer shall be subject to approval of Architect.

All work in above category shall be manufactured by one manufacturer and shall be of uniform design and finish.

- B. Manufacturer of this equipment must be able to show that he is now and for the past five years has been engaged in manufacture or distribution of equipment, as required under this contract, as his principal product.
- C. Manufacturer of equipment herein specified shall be a recognized distributor for items of equipment specified herein which are of other manufacture than his own.
- D. Only manufacturers who can meet the foregoing qualifications will be acceptable.
- E. All work shall be done in an approved workmanlike manner, to the complete satisfaction of the Owner.

1.5 SUBMITTALS

- A. Submit shop drawings as required by General Conditions. All shop drawings and rough-in drawings shall be CAD drafted, and must be submitted in .DWF or .PDF electronic format. Multiple hard copies are not acceptable.
- B. Shop drawings and bound brochures covering manufactured or "buy-out" items covering all work and equipment included in this contract shall be submitted to Architect as soon as possible after award of contract. After approval, Food Service Equipment Contractor shall furnish to Architect electronic files of shop drawings and brochures, corrected as required by virtue of review comments, for distribution to various interested trades on project. All costs of reproduction and submission shall be part of contract.

Bound brochure and cut sheet submittals must be copied to Owner for review and comment.

- C. Provide fully dimensioned rough-in plans at 1/4" scale, consisting of a separate drawing for each discipline. Each drawing shall show equipment shaded down 50%. Rough-in set shall include all required mechanical, electrical, plumbing, services for equipment and dimensioned rough-in location for same. Rough-in locations shown shall make allowances for required traps, switches, etc., thereby not requiring interpretation or adjustment on the part of other Contractors.

Drawings shall indicate dimensions for floor depressions, wall openings, etc., for equipment.

Food Service Equipment Contractor shall visit site to verify all rough-in and sleeve locations prior to installation of finished floors and shall cooperate with other Contractors involved in proper location of same. Food Service Equipment Contractor shall be responsible for any required relocations of rough-in due to errors or inaccuracies on those rough-in plans which he prepares.

- D. Rough-in plans shall include all required services which relate to equipment but which may not directly connect thereto, such as convenience outlets at walls, hose stations, floor drains, etc.
- E. Rough-in plans shall also include all required outlet services for equipment which is designated on drawing schedule, even though such equipment may not be included in this contract.
- F. Fully dimensioned and detailed shop drawings of custom fabricated equipment items shall be submitted, drawn at 3/4" and 1 - 1/2" scale for plans, elevations and sections respectively.

Drawings shall show all details of construction, installation, and relation to adjoining and related work where cutting or close fitting is required. Drawings shall show all reinforcements, anchorage, and other work required for complete installation of all fixtures.

- G. Do not begin fabrication of custom manufactured equipment until approvals of shop drawings have been received and until field measurements have been taken by Food Service Equipment Contractor, where such measurements are necessary to assure proper conformance with intent of contract drawings and specifications.
- H. Make field measurements, giving due consideration to any architectural, mechanical, or structural discrepancies which may occur during construction of building. No extra compensation will be allowed for any difference between actual measurements secured at job site and dimensions indicated on contract drawings. Any differences which may be found at job site during field measurements shall be submitted to Architect for consideration before proceeding with fabrication of equipment.
- I. Submit illustrative brochures for manufactured or "buy-out" equipment items, complete with illustrations, specifications, line drawings, rough-in requirements, and list of accessories or other specified additional requirements. Brochures shall be bound and shall include data on all equipment which is to be provided, arranged in numerical sequence which conforms to item numbers of specifications. Omission of data does not reduce obligation to provide items as specified.
- J. Approval of shop schedules and brochures will be in general and shall be understood to mean that Architect has no objection to use of materials or processes shown. Approval does not relieve Food Service Equipment Contractor from responsibility for errors, omissions, or deviations from contract requirements.

1.6 SUBSTITUTIONS - STANDARDS

- A. Refer to Instructions to Bidders and Division 01 for requirements.
- B. All unspecified substitutions after bid must be submitted to Owner for written approval prior to acceptance.

1.7 DRAWINGS

- A. Drawings which constitute part of contract documents indicate general arrangement of piping and location of equipment. Should it be necessary to deviate from arrangement indicated in order to meet structural conditions, make such deviations without expense to Owner.
- B. Specifications and drawings are reasonably exact, but their extreme accuracy is not guaranteed. Drawings and specifications are for assistance and guidance of Contractor, and exact locations, distances and levels shall be governed by the building.

1.8 MANUFACTURER'S DIRECTIONS

- A. Follow manufacturer's directions in all cases where manufacturers of articles used in this contract furnish directions or prints covering points not shown on drawings or specifications.

1.9 INDUSTRY STANDARDS

- A. Electric operated and/or heated equipment, fabricated or otherwise, shall conform to latest standards of National Electric Manufacturers Association and of Underwriters Laboratories, Inc., and shall bear the U.L. label.
- B. Cooking and hot food holding equipment shall meet minimum construction standards as noted by NSF #4.
- C. Refrigeration equipment shall meet minimum construction standards as noted by NSF #7.
- D. Items of food service equipment furnished shall bear the N.S.F. seal.
- E. Food service equipment shall be installed in accord with N.S.F. standards.
- F. Work and materials shall be in compliance with requirements of applicable codes, ordinances and regulations, including but not limited to those of Occupational Safety and Health Act (OSHA), National Fire Protection Association, State Fire Marshal, State Accident Commission, U.S. Public Health Service, State Board of Health, local health codes, etc.
- G. No extra charge will be paid for furnishing items required by regulations, even though such may not be shown on drawings or called for in these specifications.
- H. Rulings and interpretations of enforcing agencies shall be considered part of regulations.

PART 2 - PRODUCTS

2.1 MANUFACTURED EQUIPMENT

- A. All like types of equipment such as all refrigerated and heated cabinets, all ovens, and all mixers shall be by the same manufacturer.
- B. Except as may be specified otherwise under individual item specifications in "Equipment Schedule", all items of standard manufactured equipment shall be complete in accord with manufacturer's standard specification for specific unit or model called for, including finishes, components, attachments, appurtenances, etc., except as follows:
- C. All items of standard equipment shall be that manufacturer's latest model at time of delivery.
- D. Substitutions for manufactured equipment specified will be accorded consideration under terms set forth in "Substitutions - Standards".

2.2 FABRICATED EQUIPMENT

- A. Stainless steel shall be U.S. standard gauges as called for, 18-8, Type 302, or Type 304, No. 4 finish.
- B. Galvanized iron shall be Armco or equal. Framework of galvanized iron shall be welded construction, having welds smooth, and where galvanizing has been burned off, touched up with high grade aluminum bronze.

- C. Legs and crossrails shall be continuously welded, unless otherwise noted, and ground smooth.
- D. Bottom of legs at floor shall be fitted with sanitary stainless-steel bullet type foot, with not less than 2" adjustment.
- E. Legs shall be fastened to equipment as follows:
 - 1. To sinks by means of closed gussets. Gussets shall be stainless steel, reinforced with bushing, having set screws for securing legs.
 - 2. To tables and drainboards with closed gussets which shall be welded to stainless steel hat sections or channels, 14 gauge or heavier, exposed hat sections having closed ends. Bracing shall be welded to underside of tops.
- F. Closed gussets shall be a 3" minimum diameter at top, continuously welded to frame members or to sink bottom.
- G. Sinks, unless otherwise specified, shall be furnished with rotary type waste outlets, without connected overflows: Atlantic Brass Works Model 772-RB; Fisher Brass Foundry Model 250A; T&S; or approved equal. Where exposed, furnish wastes chromium plated.
- H. Rolls shall be 1 1/2" diameter, except as detailed contrary, with corners bullnosed, ground and polished.
- I. Seams and joints shall be shop welded. Welds to be ground smooth and polished to match original finish. Materials 18 gauge or heavier shall be welded.
- J. Metal tops shall be one-piece welded construction, unless specified otherwise, reinforced on underside with stainless steel hat sections or channels welded in place. Crossbracing to be not more than 30" on centers.
- K. Drawers to be 18-gauge stainless steel channel type housing and drawer cradle, both housing and cradle being reinforced and welded at corners, housing being secured to underside of table top, and both housing and cradle being sized for and fitted with 18-gauge 20" x 20" x 5" deep stainless- steel drawer insert having coved corners. Drawer insert shall be easily removable from cradle without tools or having to remove entire drawer. Drawers to have stainless steel fronts. Provide with recessed flush type stainless steel pulls.
- L. Support drawer on fabricated 14- gauge stainless steel interlocking channel solid delrin ball bearing wheels. Support slides shall be load rated at 200 lb. per pair. Slides to be Component Hardware S52 Series.
- M. Enclosed cabinet type bases shall be made of formed steel sheets reinforced with formed steel sections to create a rigid structure. Steel shall be 18-gauge or heavier. Base shall be welded construction throughout with front rails, mullions, etc., welded to appear as one-piece construction. All exposed sections of interior and exterior shall be stainless steel, and unexposed sections shall be galvanized steel, unless specified contrary.
- N. Doors shall be double cased, unless otherwise noted. Outer pans shall be 18-gauge with corners welded, ground smooth, and polished. Inner pans shall be 20-gauge, fitted tightly into outer pan with sound-deadening material such as Celotex used as core. Two pans shall be tack-welded together with seam solder filled.

Door shall finish approximately 3/4" thick and shall be fitted with flush recessed type stainless steel door pulls. Single pan type doors shall be reinforced and stiffened with closed hat sections.
- O. Hinged doors shall be flush type mounted on heavy duty stainless steel piano or concealed hinges.

- P. Hardware shall be solid materials and except where unexposed or specified contrary, of cast brass, chrome plated. Stampings are not acceptable. Identify all hardware with manufacturer's name and number so that broken or worn parts may be ordered and replaced.
- Q. Fabricate sink compartments with fully coved vertical and horizontal corners. Multiple compartment partition to be double thickness, continuously welded where sheets join at top. Front of multiple compartment sinks to be continuous on exterior. Bottoms shall be creased to drain.
- R. Ends of all fixtures, splashbacks, shelves, etc., shall be finished flush to walls or adjoining fixtures.
- S. Dishtables, drainless, splashbacks and turned-up edges shall have radius bends in all horizontal and vertical corners, coved at intersections.
- T. Rounded and coved corners or radius bends shall be 1/2" radius or longer.
- U. Shelves in fixtures with enclosed bases shall be turned up on back and sides and feathered slightly to insure tight fit to enclosure panels. Bottom shelves shall be made for easy removal unless otherwise noted.
- V. Undersides of tops to be coated with heavy-bodied resinous material compounded for permanent, non-flaking adhesion to metal, 1/8" thick, applied after reinforcing members have been installed, drying without dirt-catching crevices.
- W. Metal components, unless specified or noted otherwise, to be the following gauges:

Counter and tabletops	14 ga.	Stainless Steel
Wall shelves	16 ga.	Stainless Steel
Pipe leg undershelves	16 ga.	Stainless Steel
Drawer fronts	16 ga.	Stainless Steel
Enclosed cabinet bases	18 ga.	Stainless Steel
Sinks and drainboards	14 ga.	Stainless Steel
Legs 1 - 5/8" diameter	16 ga.	Stainless Steel
Doors (outer pan)	18 ga.	Stainless Steel
Doors (inner pan)	20 ga.	Stainless Steel

2.3 HEATING EQUIPMENT

- A. Wherever electric heating equipment or thermostat control for such equipment is specified, it shall be complete, and of the materials, size and rating specified within equipment item or details. All such equipment shall be designed and installed to be easily cleaned or to be easily removed for cleaning.
- B. Electrical appliances or heating element circuits of 120 volts shall not exceed 1650 watts, unless specifically shown contrary.

2.4 SWITCHES AND CONTROLS

- A. Food Service Equipment Contractor shall supply on each motor driven appliance or electrical heating unit suitable control switch of proper type in accord with Underwriter's Code.
- B. All internal wiring for fabricated equipment items included, all electrical devices, wiring, controls, switches, etc., built into or forming an integral part of these items shall be furnished and installed by Food Service Equipment Contractor in his factory or building site with all items complete to junction box for final connection to building lines by Electrical Contractor.

- C. Provide standard 3-prong plugs to fit "U" slot grounding type receptacles, similar to No. 5262, for all equipment items powered by plugging into 110-120 volts, single phase AC. Also, provide suitable length 3-wire cord for equipment.

2.5 CONNECTION TERMINALS

- A. All equipment shall be complete with connection terminals as standardized by equipment manufacturers, except where specified otherwise.

2.6 LOCKS

- A. Fit all doors for reach-in refrigerated compartments with locking type latches. Provide master keys.

2.7 GAS EQUIPMENT

- A. Equipment to be suitable for use with gas available at site, and to be furnished by F.S.E.C. with pressure regulators designed to work with incoming pressure.

2.8 GAS QUICK DISCONNECTS

- A. Where specified, gas quick disconnects shall be furnished complete with gas valve, gas connector hose, quick disconnect fitting elbows, and restraining cable, all AGA approved. Gas hose shall be flexible, braided or corrugated stainless steel with smooth plastic exterior coating or sleeve of heat shrink tubing (provide on all caster mounted gas equipment).
- B. All mobile cooking equipment requiring surface protection by fire suppression nozzles shall be secured in place by stainless steel cradle type wheel stops as manufactured by the Eagle Group or Select Stainless products. Plastic wheel stops are not acceptable.

PART 3 - EXECUTION

3.1 GENERAL

- A. Work under this contract and covered under this section of specifications includes but is not limited to:
 1. Cutting of holes and/or ferrules on equipment for piping, drains, electrical outlets, conduits, etc. as required to coordinate installation of food service equipment with work of other Contractors on project.
 2. Field checking of building and rough-in requirements, and submission of brochures and shop drawings, all as required hereinbefore under "Submittals".
 3. Repair of all damage to premises as result of this installation, and removal of all debris left by those engaged in this installation.
 4. Having all food service equipment fixtures completely cleaned and ready for operation when building is turned over to Owner.

3.2 INSTALLATION PROCEDURES

- A. Food Service Equipment Contractor shall make arrangements for receiving his custom fabricated and "buy out" equipment and shall make delivery into building as requisitioned by his installation superintendent. He shall not consign any of his equipment to Owner or to any other Contractor unless he has written acceptance from them and has made satisfactory arrangements for the payment of all freight and handling charges.
- B. Food Service Equipment Contractor shall deliver all of his custom fabricated and "buy out" equipment temporarily in its final location, permitting Trades to make necessary arrangements for connection of service lines; he shall then move equipment sufficiently to permit installation of service lines, after which he shall realign his equipment level and plumb, making final erection as shown on contract drawings.
- C. All portable or counter mounted equipment weighing in excess of 25 pounds shall be mounted on 4" stainless steel adjustable legs.
- D. This Contractor shall coordinate his work and cooperate with other trades working at site toward the orderly progress of the project.
- E. Architect or Owner's Agent shall have access at all times to plant or shop in which custom fabricated equipment is being manufactured, from time contract is let until equipment is shipped, in order that progress of work can be checked, as well as any technical problem which may arise in coordination of equipment with building. Any approval given at this point of manufacture shall be tentative, subject to final inspection and test after complete installation.
- F. Food Service Equipment Contractor shall assist Architect, Owner, and/or Owner's Agent in making any desired tests during or prior to final inspection of equipment; he shall remove immediately any work or equipment rejected by Architect, Owner, and/or Owner's Agent, replacing same with work conforming with contract requirements, and shall reimburse mechanical and/or other contractors involved for extra work made necessary by such replacement.
- G. This Contractor shall keep premises free from accumulation of his waste material and rubbish, and at completion of his work shall remove his rubbish and implements, leaving areas of his work broom clean.
- H. This Contractor shall provide and maintain coverings or other approved protection for finished surfaces and other parts of his equipment subject to damage during and after erection. After removal of protective coverings, all field joints shall be ground and polished and entire work shall be thoroughly cleaned and polished.

3.3 TRIMMING AND SEALING EQUIPMENT

- A. Seal completely spaces between all units to walls, ceilings, floors, and adjoining (not portable) units with enclosed bodies against entrance of food particles or vermin by means of trim strips, welding, soldering, or commercial joint material best suited to nature of equipment and adjoining surface material.
- B. Close ends of all hollow sections.
- C. Equipment butting against walls, ceilings, floor surfaces and corners to fit tightly against same; backsplashes or risers which fit against wall to be neatly scribed and sealed to wall with DowCorning # 732 RTV or General Electric clear silicone sealant, wiping excess sealant out of joint to fillet radius. Where required to prevent shifting of equipment and breaking wall seal, anchor item to floor or wall.
- D. Treat enclosed spaces (inaccessible after equipment installation) for vermin prevention in accord with industry practice.

3.4 TESTING AND DEMONSTRATION OF EQUIPMENT

- A. After completion of installation, all equipment using water, gas, and electricity shall be performance inspected and tested by factory certified service agent, including wet test of hood fire suppression systems, if so required. Food Service Equipment Contractor shall document that these inspections have been performed prior to scheduling demonstrations and Owner acceptance of equipment.
- B. Food Service Equipment Contractor shall arrange to have all manufactured, mechanically operated equipment furnished under this contract demonstrated by authorized representatives of equipment manufacturers, these representatives to instruct Owner's designated personnel in use, care and maintenance of all items of equipment after same are in working order. Demonstration and instruction shall be held on dates designated by Owner.
- C. Food Service Equipment Contractor shall provide a competent service representative to be present when installation is put into operation.

3.5 EQUIPMENT HANDLING AND STORAGE

- A. Deliver equipment to site, properly crated and protected, and store in safe place, protected from damage until time for installation.

3.6 GUARANTEE

- A. **Special Project Warranty:** Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required, provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. This warranty shall be in addition to, and not limitation of, the rights the Owner may have against the Contractor under the Contract Documents.
- B. **Warranty Period:**

1 year from date of Substantial Completion, all new equipment furnished. However, manufacturer's warranty shall prevail when the period is longer than one year.
5-year warranty period on refrigeration compressors.
10-year warranty period on walk-in panels.

3.7 OPERATING AND MAINTENANCE MANUALS

- A. After completion of installation, Food Service Equipment Contractor shall present to Owner three sets of all operating and maintenance manuals, covering all mechanically operated equipment furnished under this contract, each set being neatly bound in looseleaf binder having durable cover.
- B. Include in each binder a list of names, addresses and telephone numbers of local servicing agencies authorized to make necessary repairs and/or adjustments of equipment furnished under this contract.

PART 4 – EQUIPMENT SCHEDULE

ITEM 01	SHELVING UNIT, METAL FRAME	QUANTITY AS SCHEDULED
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Provide wire shelving unit with the following features:

- A. Arrange using quantities and sizes as shown on plan drawings

- B. 600 lb. capacity per shelf
 - C. (4) Quick-adjust shelves with removable polymer open-grid shelf mats
 - D. (4) Polymer trilobal posts, special cut length
 - E. Antimicrobial product protection
 - F. 5" Casters
- Shelving unit to be as manufactured by Metro, Model No. MQ1860G (Preferred Alternate).

ITEM 02 COLD STORAGE ASSEMBLY

QUANTITY AS SCHEDULED

Provide pre-fabricated cold storage room assembly of size and shape shown on plan and detail drawings. Exact overall size to be field verified prior to fabrication.

- A. Insulation:
Panels shall be insulated with 4" thick urethane, foamed or poured in place using HCPC (no CFC) blowing agent. Foam shall be 2.25 lb. density, 95% closed cell. Panels shall meet ASTM E-84 (UL-723) and be listed by Underwriters laboratories. Panels shall have a maximum flame spread of 25, maximum smoke developed of 450 minimum. Flash ignition of 600 degrees and minimum self-ignition of 800 degrees F.
- B. Coved corners:
Assembly shall be constructed so that all interior wall, floor and ceiling intersections shall comply with N.S.F. requirements.
- C. Cam lock fasteners:
All panel intersections and wall, floor and ceiling intersections shall be secured by cam lock fasteners.
- D. Finishes:
Exterior and interior finishes shall be as shown on drawings.
- E. Doors:
Door size and finish shall be as shown on drawings, and shall be furnished complete with sill wiper gasket, lift type hinges.
Exterior door to be equipped with automatic door closer.
Freezer door to be equipped with perimeter heat.
All doors to be equipped with heavy duty padlocking pull-handle lever, with inside safety release.
- F. Thermometers:
Each compartment to be provided with exterior flush mounted thermometer mounted at eye level to each door. Provide remote read-out for freezer compartment at exterior cooler door.
- G. Lights:
Each compartment to be furnished complete with manufacturer's standard light fixtures, with LED bulb, having protective cover, mounted and pre-wired to switch with pilot light in door section. Extra LED light fixtures as needed to provide 30 foot candles 30" above floor. Lights to be furnished and installed by this section.
- H. Ceiling panels to be one piece, self-supporting and span full width of assembly.
- I. Floor:
Recessed floor by Food Service Equipment Contractor, Integral floor by Food Service Equipment Contractor, with 0.10" aluminum diamond tread finish.
Reinforced floor panels to support minimum 1200 pounds per square foot.
The floor and ceiling shall have maximum length panels to span full length of box if possible, otherwise stagger joints so there are no common "four corner" intersections and no joints occurring in doorways.
- J. Refrigeration System:
Shall be furnished by manufacturer as part of cold storage room assembly, provide each compartment with complete refrigeration system sized to maintain appropriate temperature.
Provide temperature alarm system with remote read-out and recording capability.
Condensing units to be air-cooled, remote. Units to have performance and wiring characteristics as scheduled on drawings. Refrigeration systems to be designed for use with R404A or R-507 refrigerant only.

Condensing units to be provided with painted galvanized steel all-weather housing, controls, and crankcase heaters, all suitable for outdoor conditions, and located as shown on drawings.
Unit coolers to be low-silhouette type, mounted at locations shown on drawings. Performance and wiring characteristics to be as scheduled on drawings. Unit coolers shall be provided with on-demand defrost controls.
Evaporator drain lines to be provided by this section and extended to floor receptors outside assembly.
Freezer drain lines to be wrapped with heater cable and insulated with premolded foamed plastic insulation suitable for the application. Thickness as recommended by manufacturer.
Refrigerant piping to be ACR copper tubing, hard temper, with wrought fittings and silver solder joints. Insulate suction lines with premolded foamed plastic insulation, thickness as recommended by manufacturer for temperature and application.
Refrigeration systems to be provided with all required refrigerant piping, insulation, sight glass vibration eliminator, solenoid(s), dryer, suction line filter, expansion valve(s), thermostat(s), heat exchangers, etc. as necessary for complete installation. Provide pump down control circuit consisting of thermostat and solenoid valve. All components including piping and insulation to be installed using accepted industry standards, manufacturer's instructions and first class workmanship.

K. Miscellaneous:

Assembly to be installed on depressed building slab. See detail drawing.
Provide 1/8" diamond tread wainscott along exposed front exterior of assembly mounted from floor to 48" A.F.F.
Provide trim strips, closure panels, etc., as necessary to trim assembly to adjacent building surfaces.
Provide removable top closure panels with "C" channel rails. Lift-out panel sections to have turn-down edges for strength and are not to exceed 4'-0" in length.
Provide plastic strip curtains at door locations, transparent vinyl overlapping strips, aluminum bar hanging rod and bracket, suitable for low temperature application, as manufactured by Curtron, Flexstrip Products, Inc., or equal. Size to suit openings.
Provide heated pressure relief port in freezer.
Provide sleeves properly located for utility entrance, drain lines, and refrigeration lines, and after lines are installed, fill sleeves with spray foam compound, suitable for use in refrigerated spaces. Trim excess foam away and cover with stainless steel escutcheon.
Cold storage room shall be erected by factory trained, or factory approved installers or shall be supervised by factory personnel. Refrigeration systems shall be furnished by cold storage room manufacturer and installed by factory approved personnel. Shop drawing submittal shall indicate who the installer is, and a letter of approval shall accompany the submittal indicating the manufacturer's acceptance of the installers. This specification does not constitute a complete description of cold storage assembly, also see plan and detail drawings.

Cold storage room assembly to be as manufactured by Bally, American Panel, Imperial/Brown, or Thermo-Kool complying with specifications and drawings.

ITEM 03A DUNNAGE RACK

QUANTITY AS SCHEDULED

Provide dunnage rack with the following features:

- A. 22" x 48" x 12"
- B. Slotted, with separate polymer tie for joining racks
- C. Corrosion-proof polymer construction
- D. Bow-tie

Dunnage rack to be as manufactured by Metro, Model No. HP2248PD (Preferred Alternate), Eagle Group, or Quantum.

ITEM 03B DUNNAGE RACK

QUANTITY AS SCHEDULED

Provide dunnage rack with the following features:

- A. 22" x 60" x 12"
- B. Slotted, with separate polymer tie for joining racks
- C. Corrosion-proof polymer construction

- D. Bow-tie
Dunnage rack to be as manufactured by Metro, Model No. HP2260PD (Preferred Alternate), Eagle Group, or Quantum.

ITEM 04 SHELIVING UNIT, METAL FRAME QUANTITY AS SCHEDULED

Provide wire shelving unit with the following features:

- A. Arrange using quantities and sizes as shown on plan drawings
- B. 600 lb. capacity per shelf
- C. Removable open grid polymer shelf mats on an epoxy coated steel frame with quick adjust corner releases
- D. Wedge connectors
- D. Polymer trilobal posts, MODIFIED cut length
- E. Antimicrobial product protection
- F. 5" Polymer stem casters

Shelving unit to be as manufactured by Metro, Model No. MQ2160G (Preferred Alternate).

ITEM 05A DRYING RACK UNIT QUANTITY AS SCHEDULED

Provide can rack with the following features:

- A. Arrange using quantities and sizes as on plan drawings.
- B. (2) Shelves
- C. (2) Open shelf frames
- D. (4) 63" Mobile posts
- E. (2) Drop-ins
- F. Cutting board/tray drying rack
- G. (4) Swivel casters w/ (2) brakes
- H. Antimicrobial product protection

Can rack to be as manufactured by Metro, Model PR48VX3 (Preferred Alternate), Eagle Group, or Cambro.

ITEM 05B SHELIVING UNIT, POLY/WIRE QUANTITY AS SCHEDULED

Provide poly/wire shelving unit with the following features:

- A. Arrange using quantities and sizes as shown on plan drawings
- B. (4) Open grid shelves with removable polymer shelf mats over one-piece epoxy coated steel frames
- C. (4) Polymer posts
- D. Microban antimicrobial product protection
- E. (4) Swivel rust resistant polymer casters with 5" (127mm) polyurethane wheels (2 braked)

Shelving unit to be as manufactured by Metro, Model No. MQ-246068G-MP-4 (Preferred Alternate).

ITEM 06 MOBILE HEATED CABINET QUANTITY AS SCHEDULED

Provide mobile heated cabinet with the following features:

- A. Mobile
- B. Full-size, insulated
- C. Convection holding
- D. Accommodates (14) 18" x 26" sheet pans or (28) 13" x 18" sheet pans or (28) 12" x 20" hotel pans
- E. Load limit 65 lbs (29.25 kg) per rack
- F. (2) Field reversible hinged solid doors
- G. Magnetic door handle
- H. Membrane control
- I. HACCP temperature downloads
- J. CVap technology
- K. USB port
- L. Manual water fill
- M. Stainless steel interior & exterior

This item is to be custom fabricated in accord with General Requirements of specifications and with plan and detail drawings by Eagle Group.

ITEM 12.1 HEAVY DUTY FAUCET QUANTITY AS SCHEDULED

Provide sink mixing faucet with the following features:

- A. Wall mount
- B. 8" Centers
- C. 12" Swing nozzle
- D. Lever handles
- E. Quarter-turn Eterna cartridges
- F. 1/2" NPT female inlets, low lead

Heavy duty faucet to be as manufactured by T & S Brass, Model B-0231, Chicago Faucet, or Fisher.

ITEM 12.2 PRE-RINSE FAUCET W/ FAUCET QUANTITY AS SCHEDULED

Provide pre-rinse faucet with add on faucet with the following features:

- A. 8" Centers
- B. Wall mount base
- C. 6" Wall bracket
- D. 10" Add-on faucet
- E. Quarter-turn ceramic cartridges, low lead

Pre-rinse faucet to be manufactured by T & S Brass, Model 5PR-8W10, Chicago Faucet, or Fisher.

ITEM 13 NOT USED

ITEM 14 FLOOR TROUGH QUANTITY AS SCHEDULED

Provide floor trough having the following features:

- A. Anti-Spill Floor Trough, 36"W x 18"D x 4" deep
- B. (1) 6-1/2" Waste outlet with perforated waste basket
- C. Stainless-steel beehive strainer
- D. 14/304 stainless-steel, brushed satin finish
- E. Subway grating
- F. Basket strainer

Floor trough to be IMC Teddy, Model ASFT-1836-SG, Select Stainless, or Eagle Group.

ITEM 15 TILTING SKILLET BRAISING PAN QUANTITY AS SCHEDULED

Provide skillet braising pan with the following features:

- A. Gas heated
- B. 30-Gallon capacity
- C. Bead blasted cooking surface
- D. 10° Tilt cooking feature
- E. With easy manual hand tilt
- F. Spring-assisted cover with vent, gallon & liter markings
- G. Stainless steel construction with open leg frame
- H. Voltage as scheduled, direct connection
- I. Single pantry faucet w/ hose
- J. Power tilt w/ override
- K. Single pantry braising pan filler w/ 60" hose
- L. Food strainer

Skillet braising pan to be as manufactured by Cleveland Range, Model No. SEL30T1, Groen, or Crown.

ITEM 16 ICE MAKER, NUGGET-STYLE QUANTITY AS SCHEDULED

Provide ice maker with the following features:

- A. Nugget-style
- B. Air-cooled
- C. Self-contained condenser
- D. Production capacity of up to 644 lb./24 hours, AHRI certified at 90°F air / 70°F water.
- E. Sealed maintenance-free bearings
- F. Automatic alert indicating lights
- G. Stainless auger and evaporator
- H. One-touch cleaning
- I. Ice scoop holder
- J. Front facing removable air filter
- K. Stainless steel finish
- L. Antimicrobial protection
- M. Backflow preventer device
- N. Voltage as scheduled, cord and plug
- O. Water filtration system
- P. Voltage as scheduled, direct connection

Ice maker to be as manufactured by Scotsman, Model NH0622A-1, Ice-O-Matic, or Manitowoc.

ITEM 16.1 ICE BIN QUANTITY AS SCHEDULED

Provide ice bin with the following features:

- A. Top-hinged front-opening door
- B. 370 Lb application capacity
- C. For top-mounted ice maker
- D. 22" Width
- E. Metallic finish exterior
- F. Toolless removable baffle
- G. Polyurethane insulation, polyethylene liner
- H. Includes 6" legs
- I. Bin top

Ice bin to be as manufactured by Scotsman, Model No. B322S, Ice-O-Matic, or Manitowoc.

ITEM 17 ENCLOSED CABINET, BUN/SHEET PAN QUANTITY AS SCHEDULED

Provide tray rack with the following features:

- A. 21-1/2" x 63-1/4" x 28"
- B. Reach in
- C. Holds (35) 18" x 26" sheet pans
- D. Riveted aluminum construction
- E. Lockable door
- F. Casters

Bun/sheet pan rack to be as manufactured by Metro, Model No. CD3N, Cambro, or Eagle Group.

ITEM 18 REACH-IN REFRIGERATOR QUANTITY AS SCHEDULED

Provide reach-in refrigerator with the following features:

- A. Two-section
- B. (2) SS doors
- C. (8) Adjustable PVC coated shelves
- D. Interior lighting
- E. Stainless steel front, aluminum sides, aluminum interior with stainless steel floor
- F. 4" Casters

- G. R290 Hydrocarbon refrigerant
 - H. Voltage as scheduled, cord and plug
- Reach-in refrigerator to be as manufactured by True Model T-49-HC, Beverage Air, or Continental.

ITEM 19 NOT USED

ITEM 20 UTILITY CHASE N.I.K.C.

This item is to be furnished and installed by mechanical.

ITEM 21 EXHAUST HOOD N.I.K.C.

This item is to be furnished and installed by mechanical.

ITEM 22 FIRE SUPPRESSION SYSTEM N.I.K.C.

This item is to be furnished and installed by mechanical.

ITEM 23A COMBI-OVEN, GAS QUANTITY AS SCHEDULED

Provide combi-oven with the following features:

- A. Gas heated, natural
- B. Boilerless
- C. (6) 18" x 26" Full size sheet pan or (12) 12" x 20" x 1" hotel pan capacity
- D. EasyTouch control panel, 20 stage & 399 cooking recipes storage
- E. (4) Cooking modes: hot air, steam, combi-steam & retherm
- F. Multi-point core temperature probe
- G. Five-speed auto reversing fan
- H. Includes (3) wire rack
- I. Disappearing door, anti-microbial hygienic door handle, door hinged on right
- J. Pull-out spray hose
- K. Hands-free cleaning system
- L. Stainless steel construction
- M. Water treatment system
- N. Quick gas disconnect
- O. Voltage as scheduled, direct connection
- P. Backflow preventer
- Q. Double-stacked with Item 23B

Combi-oven to be as manufactured by Convotherm, Model No. C4 ET 6.20GS (Preferred Alternate), Alto-Shaam, or

Unox.

ITEM 23B COMBI-OVEN, GAS QUANTITY AS SCHEDULED

Provide combi-oven with the following features:

- A. Gas heated, natural
- B. Boilerless
- C. (10) 18" x 26" Full size sheet pan or (20) 12" x 20" x 1" hotel pan capacity
- D. 9" EasyTouch control panel, 20 stages each, & 399 cooking recipes storage
- E. (4) Cooking modes: hot air, steam, combi-steam & retherm
- F. Multi-point core temperature probe
- G. Five-speed auto reversing fan
- H. Includes (5) wire rack
- I. Disappearing door, anti-microbial hygienic door handle, door hinged on right
- J. Pull-out spray hose

- K. Hands-free cleaning system
- L. Stainless steel construction
- M. Water treatment system
- N. Quick gas disconnect
- O. Voltage as scheduled, direct connection
- P. Backflow preventer
- Q. Stacking kit on 6" legs
- R. Double-stacked with Item 23A

Combi-oven to be as manufactured by Convotherm, Model No. C4 ET 10.20GS (Preferred Alternate), Alto-Shaam, or

Unox.

ITEM 24A CONVECTION OVEN, GAS

QUANTITY AS SCHEDULED

Provide convection oven with the following features:

- A. Gas heated, natural
- B. Double-stacked
- C. Standard depth
- D. Capacity (5) 18" x 26" pans per compartment
- E. Solid state digital controls
- F. 2-Speed fans, interior light
- G. Simultaneous operated doors with glass
- H. Stainless steel front, sides & top, 6" stainless steel legs
- I. Flue connector
- J. Voltage as scheduled, cord and plug
- K. Top Deck, Standard Controls: Solid-State Manual control
- L. Bottom Deck, Standard Controls: Solid-State Manual control
- M. 48" Flexible gas hose with quick disconnect & restraining device
- N. Quick gas disconnect

Convection oven to be as manufactured by Blodgett, Model DFG-200 DBL (Preferred Alternate), Vulcan, or Garland.

ITEM 24B CONVECTION OVEN, GAS

QUANTITY AS SCHEDULED

Provide convection oven with the following features:

- A. Gas heated, natural
- B. Single-deck, standard depth
- C. Capacity (5) 18" x 26" pans per compartment
- D. Solid state digital controls
- E. Interior light
- G. Simultaneous operated glass doors
- H. SS front, sides & top
- I. 25" SS legs
- J. Voltage as scheduled, cord and plug
- K. Quick gas disconnect

Convection oven to be as manufactured by Blodgett, Model No. DFG-100-ES SGL (Preferred Alternate), Southbend, or

Vulcan.

ITEM 25 CONVECTION STEAMER, GAS

QUANTITY AS SCHEDULED

Provide convection steamer having the following features:

- A. Gas heated, natural
- B. Pressureless
- C. (2) Compartments

- D. (5) 12" x 20" x 2-1/2" pans
- E. Manual Controls
- F. 60-Minute mechanical timer & manual (continuous steaming) bypass switch
- G. Steam shut-off switch
- H. Left-hand hinged door, controls on right
- I. Automatic drain & water level controls
- J. Electric spark ignition
- K. Standard treated & tap water connection
- L. SS construction
- M. 6" Adjustable legs w/ flanged feet
- N. Voltage as scheduled, direct connection
- O. Quick gas disconnect
- P. Water filter
- Q. Back flow prevention device

Convection steamer to be as manufactured by Cleveland, Model 24CGA10, Accu-Temp, or Groen.

ITEM 26 WALL MOUNTED SHELVING QUANTITY AS SCHEDULED

Provide wall mounted shelving having the following features:

- A. 96"W x 12"D
- B. Rolled front edge
- C. 1-1/2"H Up-turn on sides & rear
- D. Stainless steel wall brackets, welded
- E. 14/304 stainless steel construction

Wall mounted shelving to be as manufactured by Eagle Group, Model WS1296-14/3, Advance Tabco, John Boos, or fabricated equal.

ITEM 27 HOSE REEL QUANTITY AS SCHEDULED

Provide hose reel with the following features:

- A. Enclosed
- B. 3/8" x 50 ft. Hose with 1.15 GPM spray valve
- C. 8" Wall mount mixing faucet
- D. Adjustable centers
- E. Quarter-turn Eterna cartridges with spring checks
- F. Lever handles with color coded indexes
- G. Easy install 16" and rigid 40" risers
- H. 36" Flexible water hose connector with stainless steel quick disconnect
- I. With ratcheting system & adjustable hose bumper
- J. (2) 2-3/8" wall brackets, stainless steel hose reel

Hose reel to be as manufactured by T&S Brass, Model No. B-1444 (Preferred Alternate), Chicago Faucet, or Fisher.

ITEM 28 NOT USED

ITEM 29 THREE (3) COMPARTMENT SINK CUSTOM

This item is to be custom fabricated in accord with General Requirements of specifications and with plan and detail drawings by Eagle Group.

ITEM 29.1 HEAVY DUTY FAUCET QUANTITY AS SCHEDULED

Provide sink mixing faucet with the following features:

- A. Wall mount
- B. 8" Centers

- C. 12" Swing nozzle
 - D. Lever handles
 - E. Quarter-turn Eterna cartridges
 - F. 1/2" NPT female inlets, low lead
- Heavy duty faucet to be as manufactured by T & S Brass, Model B-0231, Chicago Faucet, or Fisher.

ITEM 30 AIR CURTAIN QUANTITY AS SCHEDULED

Provide air curtain with the following features:

- A. For 60" wide door
- B. Unheated
- C. Galvanized steel cabinet
- D. Obsidian black powder coat finish
- E. Microswitch at door
- F. Voltage as scheduled, direct

Air curtain to be as manufactured by Mars Air Systems, Model No. LPN260-1UA-OB, Curtron, or Berner.

ITEM 31 PASS-THRU REFRIGERATOR QUANTITY AS SCHEDULED

Provide reach-in refrigerator with the following features:

- A. Pass-thru
- B. Two-section
- C. Self-contained refrigeration
- D. 48.33 Cu. ft. capacity
- E. (4) Full height solid hinged doors, hinging on right
- F. (8) Silver freeze (chrome-style) shelves
- G. Stainless steel exterior & interior
- H. Standard depth cabinet
- I. Electronic temperature control/indicator
- J. LED lighting
- K. Expansion valve technology
- L. Door gaskets with 2-year warranty
- M. Stainless steel breakers
- N. Voltage as scheduled, cord and plug
- O. Legs, set of 4, 6" high adjustable stainless steel

Reach-in refrigerator to be as manufactured by Victory Refrigeration, Model RS-2D-S1-PT-HC, Beverage Air, or Continental.

ITEM 32 PASS-THRU HEATED CABINET QUANTITY AS SCHEDULED

Provide pass-thru heated cabinet with the following features:

- A. Pass-Thru
- B. One-section
- C. 21.5 Cu. ft. capacity
- D. (4) Half height solid hinged doors, hinged on right
- E. (7) Silver freeze (chrome-style) shelves
- F. Standard depth cabinet
- G. Exterior digital control system
- H. Cylinder locks
- I. Stainless steel exterior, aluminum interior
- J. Legs, set of 4, 6" high adjustable stainless steel
- K. Voltage as scheduled, cord and plug

Pass-thru heated cabinet to be as manufactured by Victory Refrigeration, Model HSA-1D-1-PT-HD, Beverage Air, or Continental.

ITEM 33 NOT USED

ITEM 34 FLATWARE & TRAY CART QUANTITY AS SCHEDULED

Provide flatware and tray cart with the following features:

- A. Step down
- B. 36-3/8"W x 30"D x 36"H
- C. 14-Ga stainless steel top
- D. Molded fiberglass base, color as selected by Architect/Owner
- E. 5" Casters, all with brakes

Flatware and tray cart to be as manufactured by Low Temp Industries, Model No. 36-RTE/RTS (Preferred Alternate), Randell, or Duke.

ITEM 35 MILK COOLER QUANTITY AS SCHEDULED

Provide milk cooler with the following features:

- A. Forced air cooling
- B. Dual sided SS drop front/hold-open flip-up lids w/ locks
- C. (12) 13" x 13" x 11-1/8" capacity
- D. 33-38 Degree F temperature range, digital thermometer
- E. (3) HD floor racks
- F. Stainless exterior, aluminum interior, and S/S floor
- G. 4" Casters with front locking brakes
- H. Voltage as scheduled, cord and plug

Milk cooler to be as manufactured by True Mfg. Model No. TMC-49-S-DS-HC, Beverage Air, or Continental.

ITEM 36 SERVING COUNTER, UTILITY QUANTITY AS SCHEDULED

Provide utility serving counter with the following features:

- A. Flat S/S top
- B. 84-3/8"W x 30"D x 36"H
- C. Fully enclosed molded fiberglass base, color as selected by Architect/Owner
- D. Line up lock
- E. 5" Casters all with brakes
- F. Solid tray slide with (2) inverted "V" ridges on surface, 30" (verify with owner)
- G. LED lights
- H. Double service buffet, hinged

Utility serving counter to be as manufactured by Low Temp Industries, Model No. 84-ST-EB (Preferred Alternate), Duke, or Randell.

ITEM 36.1 ELECTRIC HOT/COLD FOOD WELL QUANTITY AS SCHEDULED

Provide electric hot/cold drop-in food well with the following features:

- A. Hot/cold/freeze well, drop-in
- B. 49-1/2"W x 26-3/4"D x 21-16/25"H
- C. 14ga SS top & wells
- D. (3) 12" x 20" pan capacity
- E. Individual wired remote
- F. Manifold drain
- G. Galvanized exterior
- H. Corresponding with Item 36
- I. Voltage as scheduled, cord and plug

Electric hot/cold drop-in food well unit to be as manufactured by Low Temp Industries, Model DI-

QSCHP-3 (Preferred Alternate), Duke, or Randell.

ITEM 36.2 ELECTRIC HOT/COLD FOOD WELL QUANTITY AS SCHEDULED

Provide electric hot/cold drop-in food well with the following features:

- A. Hot/cold/freeze well, drop-in
- B. 34-1/4"W x 26-3/4"D x 21-16/25"H
- C. 14ga SS top & wells
- D. (2) 12" x 20" pan capacity
- E. Individual wired remote
- F. Manifold drain
- G. Galvanized exterior
- H. Corresponding with Item 36
- I. Voltage as scheduled, cord and plug

Electric hot/cold drop-in food well unit to be as manufactured by Low Temp Industries, Model DI-QSCHP-2 (Preferred Alternate), Duke, or Randell.

ITEM 36.3 SNEEZE GUARD, STATIONARY CUSTOM

This item is to be custom fabricated in accord with General Requirements of specifications and with plan and detail drawings by BSI.

ITEM 37 SERVING COUNTER, UTILITY QUANTITY AS SCHEDULED

Provide utility serving counter with the following features:

- A. Flat SS top
- B. 66-3/8"W x 30"D x 36"H
- C. Fully enclosed molded fiberglass base, color as selected by Architect/Owner
- D. Line up lock
- E. 5" Casters all with brakes
- F. Solid tray slide with (2) inverted "V" ridges on surface, 30" (verify with owner)
- G. LED lights
- H. Double service buffet, hinged

Utility serving counter to be as manufactured by Low Temp Industries, Model No. 66-ST-EB (Preferred Alternate), Duke, or Randell.

ITEM 37.1 ELECTRIC HOT/COLD FOOD WELL QUANTITY AS SCHEDULED

Provide electric hot/cold drop-in food well with the following features:

- A. Hot/cold/freeze well, drop-in
- B. 63-3/4"W x 26-3/4"D x 21-16/25"H
- C. 14ga SS top & wells
- D. (4) 12" x 20" pan capacity
- E. Individual wired remote
- F. Manifold drain
- G. Galvanized exterior
- H. Corresponding with Item 37
- I. Voltage as scheduled, cord and plug

Electric hot/cold drop-in food well unit to be as manufactured by Low Temp Industries, Model DI-QSCHP-4 (Preferred Alternate), Duke, or Randell.

ITEM 37.2 SNEEZE GUARD, STATIONARY CUSTOM

This item is to be custom fabricated in accord with General Requirements of specifications and with plan and detail drawings by BSI.

ITEMS 38-39 NOT USED

ITEM 40 SERVING COUNTER, UTILITY QUANTITY AS SCHEDULED

Provide utility serving counter with the following features:

- A. Flat SS top
- B. 50-3/8"W x 30"D x 36"H
- C. Fully enclosed molded fiberglass base, color as selected by Architect/Owner
- D. Line up lock
- E. 5" Casters all with brakes
- F. Solid tray slide with (2) inverted "V" ridges on surface, 30" (verify with owner)
- G. LED lights
- H. Rear storage opening
- I. Double buffet service, hinged

Utility serving counter to be as manufactured by Low Temp Industries, Model No. 50-ST (Preferred Alternate), Duke, or Randell.

ITEM 40.1 ICE CREAM CABINET, DROP-IN QUANTITY AS SCHEDULED

Provide ice cream dipping cabinet with the following features:

- A. Drop-in
- B. Easy lift see-thru lid
- C. Lighted shelves
- D. (2) 10"W x 20"D x 6" deep white plastic coated baskets
- E. Voltage as scheduled, cord and plug
- F. Corresponding with Item 40

Ice cream dipping cabinet to be as manufactured by Low Temp Industries, Model DI-2222-IC (Preferred Alternate), Duke, or Randell.

ITEM 41 CASH REGISTER STAND QUANTITY AS SCHEDULED

Provide cash register stand with the following features:

- A. Single end station
- B. 66-3/8"W x 30"D x 36"H
- C. Stainless steel top
- D. Molded fiberglass base, color as selected by Architect/Owner
- E. 5" Casters all with brakes
- F. 3" Knock-out top
- G. Line up lock
- H. Locking cash drawer
- I. Solid tray slide with (2) inverted "V" ridges on surface, 30" (verify with owner)
- J. Base with storage area
- K. Voltage as scheduled, cord and plug

Cash register stand to be as manufactured by Low Temp Industries, Model 66-CSE (Preferred Alternate), Duke, or Randell.

ITEM 42 P.O.S. STATION N.I.K.C.

This item is to be furnished by Owner.

ITEM 43 SERVING COUNTER, UTILITY QUANTITY AS SCHEDULED

Provide utility serving counter with the following features:

- A. Flat SS top

- B. 50-3/8"W x 30"D x 36"H
 - C. Sliding door, cylinder lock
 - D. 5" Casters all with brakes
 - E. Solid tray slide with (2) inverted "V" ridges on surface, 30" (verify with owner)
 - F. Base with rear storage opening
 - G. Molded fiberglass base, color as selected by Architect/Owner
- Utility serving counter to be as manufactured by Low Temp Industries, Model No. 50-ST (Preferred Alternate), Duke, or Randell.

END OF SECTION 114000

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SECTION 115100 - LIBRARY FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Wood case shelving.

1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that casework can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work and the building structure. Indicate clear width of aisles from face of units. Show fabrication details. Show installation details, including field joints and filler panels. Indicate manufacturer's catalog numbers for casework.
- C. Samples for Verification: 8-by-10-inch Samples for each type of finish, and the following:
 - 1. One full-size finished bookcase.
 - 2. Maintain full-size Samples at Project site during construction in an undisturbed condition as a standard for judging the completed Work. Unless otherwise indicated, approved sample units may become part of the completed Work if in undisturbed condition at time of Substantial Completion. Notify Architect of their exact locations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish complete touchup kit for each type and finish of casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged casework finish.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation of units required for this Project.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other-than-installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
- B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of library stack system that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metals, metal finishes, and other materials beyond normal wear.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CASEWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.
 - 1. Grade: Custom.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Provide library stack systems capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

2.3 WOOD CASE SHELVING

- A. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or a comparable product by one of the following:
 - 1. Brodart Co.; Contract Library Furniture Division. (Basis of Design).
 - 2. Buckstaff Company (The).
 - 3. Fleetwood Group Furniture.
 - 4. ModuForm.
 - 5. Worden Company (The).
 - 6. Russwood Library Furniture.
- B. Wood Case Library Shelving: Shelving designed for library use and consisting of full end, top, and back panels, with end panels made to receive pins to support adjustable shelves.
 - 1. Configuration: Self-supporting and starter/adder units as indicated.

2. Vertical Panels: Panels consisting of veneer panels, 5 or 9 ply, 1 inch thick plywood, with 1/4-inch solid-wood banding. Provide 2 rows of holes at 1-1/4-inch intervals for 5/16-inch shelf support pins on 1 side of end panels and both sides of intermediate panels.
 3. Base Frames: Solid hardwood toe kick, back rail, and 2 end cleats, 3 to 4 inches high, designed to support bottom shelf and fabricated to attach and tie together vertical panels.
 4. Tops: 3/4- to 1-inch- thick, veneer panel banded with 2- to 3-inch solid hardwood fasciae on 1 side for single-faced units and on 2 sides for double-faced units, fabricated to attach and tie together vertical panels.
- C. Back and Divider Panels: Veneer-faced panels, 3/4-inch plywood where exposed, 1/4-inch hardboard dadoed into sides, bottoms, and tops where not exposed.
- D. Wood Shelves: Panels consisting of solid hardwood boards glued together, 3/4 inch thick, and grooved on underside to rest securely on supporting pins.
1. Edge Treatment: Solid hardwood with eased edges, matching wood species, cut, and finish as bookcase.
 2. Color and Pattern: as selected by Architect from manufacturer's standard range.
- E. Clips: Heavy-duty brass plated steel shelf clips, to fit into holes at 32 mm on center.

2.4 MATERIALS

- A. Solid Wood: Clear hardwood lumber, selected for compatible grain and color.
- B. Wood Species and Veneer Cut: Red Oak, Plain sawn.
1. Staining and Finish: As selected by Architect from manufacturer's full line.
 - a. Coordinate finishes to match with Owner-provided library stack shelving.
- C. Veneer-Faced Panels: HPVA HP-1, with face veneer of species indicated, with Grade A faces.
1. Wood Species and Veneer Cut: Red Oak, Plain sawn.
 2. Staining and Finish: As selected by Architect from manufacturer's full line.
 - a. Coordinate finishes to match with Owner-provided library stack shelving.
- D. Edgebanding: Minimum 1/8-inch thick, solid wood of same species as face veneer.

2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating metal finishes.
- 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 the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 WOOD FINISHES

- A. Preparation: Sand shelving units after assembling for uniform smoothness at least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.

- B. Staining: Remove fibers and dust and apply wash-coat sealer and stain to exposed and semiexposed surfaces as required to provide uniform color and to match approved samples.
- C. Finishing: Apply manufacturer's standard, baked, clear finish consisting of a sealer and a conversion varnish or nitrocellulose lacquer topcoat. Sand and wipe clean between applications of sealer and topcoat.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for conditions affecting performance of library stack systems.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of library stack systems.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum finished floor over which shelving is to be installed.

3.3 INSTALLATION, GENERAL

- A. Install bookshelf units at locations indicated, in continuous ranges made up of number of units shown, complying with manufacturer's instructions. Set units plumb and level units with integral adjustable leveling devices to a tolerance of 1/8 inch in 96 inches for level and plumb.
- B. Where casework abuts other finished work, scribe and apply filler strips for accurate fit with fasteners concealed where practicable.
- C. Anchor single-faced ranges over 42 inches in height directly to building wall or partition, using manufacturer's recommended method.
- D. Install adjustable shelves at equal spacings unless otherwise indicated.
- E. Level bookstack units with integral adjustable leveling devices to a tolerance of 1/8 inch in 96 inches for level and plumb.

END OF SECTION 115100

SECTION 115213 - PROJECTION SCREENS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Electrically operated, front-projection screens and controls.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show layouts and types of front-projection screens. Include the following:
 - 1. Drop lengths.
 - 2. Location of seams in viewing surfaces.
 - 3. Location of screen centerline relative to ends of screen case.
 - 4. Anchorage details, including connection to supporting structure for suspended units.
 - 5. Details of juncture of exposed surfaces with adjacent finishes.
 - 6. Location of wiring connections for electrically operated units.
 - 7. Wiring diagrams for electrically operated units.
 - 8. Accessories.
- C. Samples for Initial Selection: For finishes of surface-mounted screen cases.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For front-projection screens to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations for Projection Screens: Obtain projection screens from single manufacturer. Obtain accessories, including necessary mounting hardware, from screen manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Environmental Limitations: Do not deliver or install front-projection screens until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.6 COORDINATION

- A. Coordinate layout and installation of front-projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, and partitions.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Source Limitations for Projection Screens: Obtain front-projection screens from single manufacturer. Obtain accessories, including necessary mounting hardware, from screen manufacturer.
1. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or a comparable product by one of the following:
 - a. Da-Lite Screen Company; Professional Electrol – Automatic Electric Projection Screen System (Basis of Design)
 - b. Bretford, Inc.
 - c. Draper Inc.

2.2 ELECTRICALLY OPERATED, FRONT-PROJECTION SCREENS

- A. General: Manufacturer's standard units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Provide units that are listed and labeled as an assembly by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Controls: Remote, three-position control switch installed in recessed device box with flush cover plate matching other electrical device cover plates in room where switch is installed.
 - a. Provide number of control switches indicated for each screen.
 - b. Provide power supply for low-voltage systems if required.
 - c. Provide locking cover plates for switches.
 - d. Provide infrared remote control consisting of battery-powered transmitter and receiver.
 - e. Provide video interface control for connecting to projector. Projector provides signal to raise or lower screen.
 3. Motor in Roller: Instant-reversing motor of size and capacity recommended by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
 4. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8-inch- diameter metal rod with ends of rod protected by plastic caps.
 - a. Roller for motor in roller is supported by vibration- and noise-absorbing supports.
 5. Tab Tensioning: Provide units that have a durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of screen by tabs to pull screen flat horizontally.
- B. Suspended, Electrically Operated Screens without Ceiling Closure, with Motor-in-Roller, and with Tab Tensioning: Units designed and fabricated for suspended mounting, with bottom of case entirely or partially open under screen compartment.
1. Provide metal or metal-lined wiring compartment.
 2. Screen Case: Made from metal.
 3. Provide screen case with trim flange to receive ceiling finish.
 4. Finish on Exposed Surfaces: Vinyl covering or baked enamel.

2.3 FRONT-PROJECTION SCREEN MATERIAL

- A. Matte Reflective Viewing Surface: Peak gain of not less than 1.3, and half-gain angle of at least 40 degrees from the axis of the screen surface.
- B. Material: Vinyl-coated, glass-fiber fabric.
- C. Mildew-Resistance Rating: Zero or 1 when tested according to ASTM G 21.
- D. Flame Resistance: Passes NFPA 701.
- E. Flame-Spread Index: Not greater than 75 when tested according to ASTM E 84.
- F. Seams: Where length of screen indicated exceeds maximum length produced without seams in material specified, provide screen with horizontal seam placed as follows:
 - 1. At bottom of screen at juncture between extra drop length and viewing surface.
 - 2. In location indicated.
- G. Seamless Construction: Provide screens, in sizes indicated, without seams.
- H. Edge Treatment: Black masking borders.
- I. Size of Viewing Surface: 12 by 12 feet.
- J. Aspect Ratio: 16:10.
- K. Provide extra drop length of dimensions and at locations indicated.
 - 1. Color: Black.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install front-projection screens at locations indicated to comply with screen manufacturer's written instructions.
- B. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.
 - 1. Install low-voltage controls according to NFPA 70 and complying with manufacturer's written instructions.
 - a. Wiring Method: Install wiring in raceway except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.
 - 2. Test electrically operated units to verify that screen controls, limit switches, closures, and other operating components are in optimum functioning condition.
 - 3. Test manually operated units to verify that screen-operating components are in optimum functioning condition.

END OF SECTION 115213

SECTION 115700 - VOCATIONAL SHOP EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes vocational shop equipment as follows:
 - 1. Flammable storage cabinet.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics and requirements, and furnished specialties and accessories.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details and attachments to other work.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.3 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with vocational shop equipment by field measurements before fabrication.

1.4 COORDINATION

- A. Coordination: Furnish inserts and anchoring devices which must be set in concrete for installation of vocational shop equipment work. Coordinate delivery of inserts and anchorages with other work to avoid delay.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Do not stack other items on top of packaged kilns during transportation and storage. Store kilns with top end up.
- B. Utilize equipment capable of moving vocational shop equipment without damage.
- C. Protect vocational shop equipment from damage due to weather, excessive temperature and construction operations.

PART 2 - PRODUCTS

2.1 FLAMMABLE STORAGE CABINET

- A. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or comparable product by one of the following:
 - 1. Jamco Products; Model BM45 (Basis of Design).
 - 2. Eagle.
 - 3. Global Industrial.

4. Stronghold.
- B. Standards: Provide all-welded steel storage cabinet for the storage of class I, II, and III flammable liquids complying with the following:
1. NFPA Flammable Liquid Storage, #30.
 2. OSHA standard 1910.106.
- C. Safety Cabinet: Double-wall insulated steel cabinet.
1. Thickness: 18-gauge steel cabinet with 1-1/2-inch airspace.
 2. Adjustable shelves with drip edges on 2-1/2-inch center.
 - a. Capacity: 45 gallons.
 - b. Number of Shelves: Two.
 3. Dimensions: 65" H by 43" W by 18" D.
 4. Finish: Chemical-resistant powder coat.
- D. Closure: Self-closing double doors on fusible link.
1. Flush handle.
 2. Three-point latch, double key set.
- E. Two 2-inch vents with integral flame arresters.
- F. Trilingual warning label.
- G. Leveling feet.
- H. Grounding connector.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, clearance requirements, service rough-ins, and other conditions affecting performance of work.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install vocational shop equipment in strict accordance with manufacturer's written recommendation and approved Shop Drawings.
- B. Set units level, plumb, properly aligned and securely in place.
- C. Verify that accessories required have been furnished and installed.
- D. Remove packing material and leave vocational shop equipment in clean condition, ready for operation.

3.3 PROTECTION

- A. Take strict care to prevent scratching or damage. Replace damaged components which cannot be repaired to satisfaction of Architect.

END OF SECTION 115700

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SECTION 116143 - STAGE CURTAINS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes stage curtains and draw-curtain tracks.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for stage curtains. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each fabric and for each color and texture specified, full width by 36 inches in size, from dye lot to be used for the Work, with specified treatments applied.
- D. Delegated-Design Submittal: For stage-curtain systems and attachments to structure, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Structural members to which tracks, battens, and other stage-curtain equipment will be attached.
 - 2. Locations of lighting fixtures and cabling, ductwork, piping, and sprinklers.
 - 3. Rigging equipment for stage equipment.
 - 4. Access panels.
- B. Qualification Data: For Installer and professional engineer.
- C. Product Certificates: For the following, from manufacturer:
 - 1. Fabric: Provide name of flame-retardant chemical used, identification of applicator, treatment method, application date, allowable life span for treatment, and details of any restrictions and limitations.
 - 2. Rigging: Compliance of suspended tracks with requirements.
- D. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For stage curtains and rigging to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of stage curtains.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not install stage curtains until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify locations of supporting structural elements and construction contiguous with stage curtains and rigging by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of rigging equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, faulty operation of rigging equipment.
 - 2. Warranty Period: Two 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 stage-curtain systems, including comprehensive engineering analysis and attachments to building structure, using performance requirements.
- B. Structural Performance: Stage-curtain systems and attachments to structure shall withstand the effects of gravity and operational loads and the following loads and stresses:
 - 1. Design Loads: Weight of curtains.
- C. Fire-Test-Response Characteristics: Provide stage curtains with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Flame-Resistance Ratings: Passes NFPA 701.
 - a. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or treated with flame-retardant chemicals, and whether it requires retreatment after designated time period or cleaning.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Drapery:
 - a. Greenville Stage Equipment (Basis-of-Design).
 - b. Georgia Stage
 - c. Dazian LLC.
 - d. Frankel/Fabric.
 - e. JB Martin Company.
 - f. J. L. de Ball America, Inc.
 - g. KM Fabrics, Inc.
 - h. Valley Forge Fabrics, Inc.

2. Rigging Track and Hardware:
 - a. Automatic Devices Company; ADC #280 (Basis of Design)
 - b. Advance Devices Company
 - c. H & H Specialties Inc.
 - d. Tru-Roll, Inc.

2.3 CURTAIN FABRICS

- A. General: Provide fabrics inherently and permanently flame resistant or chemically flame resistant by immersion treatment to comply with requirements indicated. Provide fabrics of each type and color from same dye lot.
- B. Heavyweight Woven Cotton Velour: Napped fabric of 100 percent cotton weighing not less than 25 oz./linear yd. before flame-retardant treatment, with pile height not less than 79 mils; 54-inch minimum width.
 1. Color: As indicated on Room Finish Legend.

2.4 CURTAIN FABRICATION

- A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on curtain not visible to audience. Provide vertical seams unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than one-half width.
 1. Vertical Hems: Provide vertical hems not less than 2 inches wide, and not less than 4 inches wide at borders, valance, teasers, and tormentors, with not less than a 1-inch tuck, and machine sew with no selvage material visible from front of curtain. Sew open ends of hems closed.
 2. Leading Edge Turnbacks: Provide turnbacks formed by folding back not less than 12 inches of face fabric, with not less than a 1-inch tuck, and secure by sewing turnbacks vertically.
 3. Top Hems: Reinforce top hems by double-stitching 3-1/2-inch- wide, heavy jute webbing to top edge on back side of curtain with not less than 2 inches of face fabric turned under.
 4. Pleats: Provide 50 percent fullness in curtains, exclusive of turnbacks and hems, by sewing additional material into 6-inch double-stitched box pleats sewn flat and spaced at 12 inches o.c. along top hem reinforcement.
 5. Bottom Hems: Provide hems not less than 6 inches deep with weight tape.
- B. Back Curtain: Box Pleat with 100% fullness.
- C. Main Curtain: Box Pleat with 100% fullness.
- D. Mid-Stage Traveler/Border: Box Pleat with 75% fullness
- E. Valance: Box Pleat with 100% fullness.
- F. S-Hooks: Track Manufacturer's standard heavy-duty plated-wire hooks, not less than 2 inches long.

2.5 STEEL-CURTAIN TRACK

- A. Steel Track: Fabricate of roll-formed, galvanized, commercial-quality, zinc-coated steel sheet; complying with ASTM A 653/A 653M; G60 coating designation with continuous bottom slot and with each half of track in one continuous piece.

- B. Clamp and Bracket Hangers: Manufacturer's steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.
- C. Track Lap Clamp: Metal to match track channel for attaching double-sectioned track at center overlap.
- D. Fold Guide: Equip carriers with rear-fold or backpack guide and rubber spacers to permit offstage curtain folding; sized for use with operating line if any.
- E. Curtain Rails: Provide end stops for track rails.
- F. Curtain Carriers: Standard carriers with a quantity of curtain carriers sufficient for track length, to suit curtain fabrication. Include one master carrier for each leading curtain edge.
- G. Manual Operation: Provide with cord operating line consisting of manufacturer's standard 3/8-inch-diameter, stretch-resistant operating cord consisting of braided synthetic-fiber jacket over solid, synthetic-fiber, linear filaments.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions affecting performance of stage-curtain work. Examine inserts, clips, blocking, or other supports required to be installed by others to support tracks and battens.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Install stage-curtain system according to track manufacturers and curtain fabricator's written instructions.
- D. Ceiling-Mounted Tracks: Drill track at intervals not greater than manufacturer's written instructions for spacing, and fasten directly to structure.
- E. Install track for center-parting curtains with not less than 24-inch overlap of track sections at center, supported by special lap clamps.
- F. Track Hung: Secure curtains to track carriers with S-hooks.

END OF SECTION 116143

SECTION 116623 - GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Basketball equipment.
 - 2. Safety pads.
 - 3. Gymnasium storage accessories.

1.2 DEFINITIONS

- A. NFHS: The National Federation of State High School Associations.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. If applicable, include assembly, disassembly, and storage instructions for removable equipment.
 - 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: For gymnasium equipment. Include plans, elevations, sections, details, attachments to other work, and the following:
 - 1. Method of field assembly for removable equipment, connections, installation details, mountings, floor inserts, attachments to other work, and operational clearances.
 - 2. Transport and storage accessories for removable equipment.
- C. Samples for Initial Selection: For each type of gymnasium equipment indicated.
- D. Delegated Design: Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation including loads, point reactions, and locations for attachment of gymnasium equipment to structure.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Court layout plans, drawn to scale, and coordinating floor inserts, game lines, and markers applied to finished flooring.
- B. Product Certificates: For each type of gymnasium equipment, signed by product manufacturer.
- C. Qualification Data: For Installer.
- D. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium equipment to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

1.8 COORDINATION

- A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.
- B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Provide basketball backboards capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Extruded Bars, Profiles, and Tubes: ASTM B 221.
 - 2. Cast Aluminum: ASTM B 179.
 - 3. Flat Sheet: ASTM B 209.
- B. Steel: Comply with the following:
 - 1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 2. Steel Tubing: ASTM A 500 or ASTM A 513, cold formed.
 - 3. Steel Sheet: ASTM A 1011/A 1011M.
- C. Support Cable: 1/4-inch- diameter, 7x19 galvanized steel aircraft cable with a breaking strength of 7000 lb. Provide fittings complying with cable manufacturer's written instructions for size, number, and method of installation.
- D. Support Chain and Fittings: Grade 80 hardened alloy steel chain rated for overhead lifting, ASTM A 391/A 391M, with commercial-quality, zinc-plated steel connectors and hangars.
- E. Castings and Hangars: Malleable iron, ASTM A 47/A 47M, grade required for structural loading.
- F. Particleboard: ANSI A208.1, made with adhesive containing no urea formaldehyde.

- G. Equipment Wall-Mounting Board: Wood, transparent or neutral-color painted finish, size, and quantity as required to mount gymnasium equipment according to manufacturer's written instructions.
- H. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design.
- I. Grout: Nonshrink, nonmetallic, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

2.3 BASKETBALL EQUIPMENT

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Basis-of-Design or a comparable product by one of the following:
 - 1. Performance Sports Systems (Basis-of-Design).
 - 2. AALCO Manufacturing.
 - 3. Draper, Inc.
 - 4. Institutional Products Inc.
 - 5. Jaypro Sports, LLC.
 - 6. Porter Athletic Equipment Company.
 - 7. Progressive Sports Construction.
- B. General: Provide equipment complying with requirements in NCHSAA's "NCHSAA Basketball Rule Book."
 - 1. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.
- C. Wall-Mounted, Adjustable Height Backstops (BB): Complete assembly extending from wall, including support framing to building structure, bracing, cables, chains, pulleys, fittings, hardware, pipe anchors, equipment pads, and fasteners.
 - 1. Stationary Type: Manufacturer's standard assembly for stationary backstop.
 - a. Basis-of-Design: Performance Sports System; Model #P2300-9124GL.
 - 2. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.
 - a. Finish: Manufacturer's standard powder-coat finish.
 - 3. Extension: As indicated on Drawings.
 - 4. Goal Height Adjuster: Adjustable from 8 to 10 feet with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.
 - a. Operation: Manual operation with detachable crank handle.
 - 5. Operation: Fully-enclosed worm gear winch, designed to hold backstop in any position, with detachable crank handle. Hoisting cable shall be 1/4-inch galvanized aircraft cable operating through 4-inch diameter pulleys.
- D. Backboard Safety Device: Designed to limit free fall if support cable, support chain, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; 7300-lb load capacity; one per folding backboard.
 - 1. Retractor Device: Manufacturer's standard device designed to retract both support and safety cables, chains, and straps away from play of the basketball when backboard is in playing position; one per folding backboard.

- E. Goal Mounting Assembly: Compatible with goal, backboard, and support framing; with hole pattern that is manufacturer's standard for goal attachment.
1. Glass Backboard Goal Mounting Assembly: Goal support framing and reinforcement designed to transmit load from goal to backboard frame and to minimize stresses on glass backboard.
 2. Direct Mount: Designed for mounting goal directly and independently to center mast of backboard support framing so no force, transmitted by ring, is directly applied to backboard and rigidity and stability of goal are maximized.
- F. Glass Backboards: With predrilled holes or preset inserts for mounting goals, and as follows:
1. Rectangular, 72 by 42 inches width by height.
 2. Material: Glass, not less than 1/2-inch- thick, transparent tempered glass. Provide glass with impact-absorbing resilient rubber or PVC gasket around perimeter in a fully welded, brushed-natural-finish, extruded-aluminum frame, with steel subframe, reinforcement, and bracing, including center-strut frame reinforcement, and with mounting slots for mounting backboard frame to backboard support framing.
 3. Target Area and Border Markings: Permanently etched in white color, marked in pattern and stripe width according to referenced rules.
 4. Rim-Restraining Device: Complying with NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.
- G. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication complying with referenced rules.
 2. Type: Movable, breakaway design with manufacturer's standard breakaway mechanism including positive-lock, preset pressure release, set to release at 230-lb load, and automatic reset. Provide movable ring with rebound characteristics identical to those of fixed, nonmovable ring.
 3. Mount: Front.
 4. Net Attachment: No-tie loops for attaching net to rim without tying.
 5. Finish: Manufacturer's standard powder-coat finish.
- H. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches long, sized to fit rim diameter, and as follows:
1. Cord: Made from white nylon.
 2. Competition Cord: Antiwhip, made from white nylon cord not less than 120- or more than 144-gm thread.

2.4 SAFETY PADS

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
1. Draper, Inc. (Basis-of-Design).
 - a. Product: EcoVision Wall Pad.
 2. AALCO Manufacturing.
 3. Jaypro Sports, LLC.
 4. Performance Sports Systems.
 5. Porter Athletic Equipment Company.
- B. Safety Pad Surface-Burning Characteristics: ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. Flame-Spread Index: 25 or less.

2. Smoke-Developed Index: 450 or less.
- C. Pad Coverings: Provide safety pad fabric covering fabricated from puncture- and tear-resistant, not less than 14-oz./sq. yd PVC-coated polyester or nylon-reinforced PVC fabric treated with fungicide for mildew resistance; with surface-burning characteristics indicated.
- D. Wall Safety Pads: Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with visible surfaces fully covered by seamless fabric covering, free of sag and wrinkles and firmly attached to back of backer board.
 1. Backer Board: Not less than 3/8-inch- thick plywood, mat formed, or composite panel.
 2. Fill: Multiple-impact-resistant foam not less than 2-inch- thick bonded polyurethane, 6.0-lb/cu. ft. density.
 3. Size: Each panel section, 24 inches wide by not less than 72 inches long.
 4. Number of Panel Sections: As indicated modular panel sections.
 5. Installation Method: Manufacturer's standard.
 6. Provide manufacturer's standard trim in matching color around electrical outlets.

2.5 GYMNASIUM STORAGE ACCESSORIES

- A. Hoola Hoop and Jump Rope Hooks: Belwith P27305 or equal.
 1. Finish: Oil rubbed bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
 1. Verify critical dimensions.
 2. Examine supporting structure and subfloors and footings below finished floor.
 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked. Locate reinforcements and mark locations.
 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly, where required.
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, have been completed.
- C. Permanently Placed Gymnasium Equipment and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.
 1. Floor Insert Location: Coordinate location with application of game lines and markers.

2. Floor Insert Elevation: Coordinate installed heights of floor insert with installation and field finishing of finish flooring and type of floor plate.
 3. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.
- D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing built-in and permanently placed gymnasium equipment to structural support and for properly transferring load to in-place construction.
- E. Connections: Connect automatic operators to building electrical system.
- F. Removable Gymnasium Equipment and Components: Assemble in place to verify that equipment and components are complete and in proper working order. Instruct Owner's designated personnel in properly handling, assembling, adjusting, disassembling, transporting, storing, and maintaining units. Disassemble removable gymnasium equipment after assembled configuration has been approved by Architect, and store units in location indicated on Drawings.

3.3 ADJUSTING

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.4 CLEANING

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION 116623

SECTION 122113 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Horizontal louver blinds with aluminum slats.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds.
- C. Samples: For each exposed product and for each color and texture specified, 12 inches long.
- D. Window-Treatment Schedule: For horizontal louver blinds. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of horizontal louver blind, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For horizontal louver blinds to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining horizontal louver blinds and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to finishes and performance.
 - 3. Operating hardware.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide horizontal louver blinds with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Flame-Resistance Ratings: Passes NFPA 701.
- B. Source Limitations: Obtain horizontal louver blinds through one source from a single manufacturer.
- C. Product Standard: Provide horizontal louver blinds complying with WCSC A 100.1.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver horizontal louver blinds in factory packages, marked with manufacturer and product name, fire-test-response characteristics, lead-free designation, and location of installation.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and dirty finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS (HLB)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. SWF Contract (Basis-of-Design).
 - 2. CACO Inc.
 - 3. Hunter Douglas Contract.
 - 4. WT Shade; a division of InPro.
- B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radiused corners.
 - 1. Width: 1 inch.
 - 2. Thickness: No less than 0.008 inch.
 - 3. Finish: As selected by Architect from manufacturer's full range of colors.
 - a. Ionized Coating: Antistatic, dust-repellent, baked polyester finish.
 - b. Reflective Coating: Manufacturer's special coating enhancing the reflection of solar energy on the outside-facing slat surface.
- C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled; fully enclosing operating mechanisms on three sides and end plugs.
 - 1. Finish Color: Match color, texture, pattern, and gloss of louver slats.
- D. Bottom Rail: Formed-steel or extruded-aluminum tube, sealed with plastic or metal capped ends top contoured to match crowned shape of louver slat and bottom contoured for minimizing light gaps; with enclosed and protected ladders and tapes to prevent their contact with sill.
- E. Ladders: Evenly spaced to prevent long-term slat sag.
 - 1. For Blinds with Nominal Slat Width 1 Inch or Less: Braided cord.
- F. Lift Operation: Manual, cord lock; locks pull cord to stop blind at any position in ascending or descending travel.

- G. Tilt Control: Enclosed worm-gear mechanism, slip clutch or detachable wand preventing over-rotation, and linkage rod.
 - 1. Tilt Operation: Manual with clear plastic wand.
 - 2. Length of Tilt Control: Manufacturer's standard of length required to make operation convenient from floor level.
 - 3. Tilt: Full.
- H. Valance: Manufacturer's standard.
- I. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
 - 1. Type: End.
 - 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.
- J. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.

2.2 HORIZONTAL LOUVER BLIND FABRICATION

- A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.
- B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
 - 1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows:
 - 1. Between (Inside) Jamb Installation: Width equal to 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch, less than jamb-to-jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch, plus or minus 1/8 inch, less than head-to-sill dimension of opening in which each blind is installed.
- D. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail, valance, and operating hardware, and for hardware position and blind mounting method indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- F. Color-Coated Finish: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- G. Component Color: Provide rails, cords, ladders, and exposed-to-view metal and plastic matching or coordinating with slat color, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
 - 2. Install mounting and intermediate brackets to prevent deflection of headrails.
 - 3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.3 ADJUSTING

- A. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free of binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean horizontal louver blind surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer and that ensures that horizontal louver blinds are without damage or deterioration at time of Final Acceptance.
- C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

END OF SECTION 122113

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manually-operated roller shades with single rollers.
 - 2. Motor-operated roller shades with single rollers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
 - 1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified
 - 1. Shadeband Material: Not less than 10 inches square. Mark inside face of material if applicable.
- D. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of shadeband material, signed by product manufacturer.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roller shades to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain roller shades from single source from single manufacturer.
- B. Fire-Test-Response Characteristics: Provide products passing flame-resistance testing according to NFPA 701 by a testing agency acceptable to authorities having jurisdiction.
- C. Electronic Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Product Standard: Provide roller shades complying with WCMA A 100.1.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Roller Shades: Subject to compliance with requirements, provide basis of design indicated or comparable product by one of the following:
 - 1. SWF Contract (Basis-of-Design).
 - 2. Draper Inc.
 - 3. Lutron Shading Solutions by VIMCO
 - 4. MechoShade Systems, Inc.
 - 5. Hunter Douglas Contract
- B. Motorized Shade Operators: Subject to compliance with requirements, provide basis of design indicated or comparable product by one of the following:
 - 1. Lutron Electronics Company; Sivoia QED (Basis of Design)
 - 2. Elero USA Inc.
 - 3. SIMU US, Inc.
 - 4. SOMFY Systems.
 - 5. Shade operators may also be provided by approved manufacturer of roller shade.

2.2 MANUALLY-OPERATED, SINGLE-ROLLER SHADES (RS-1 AND RS-3)

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - 1. Basis of Design: SWF Contract; Pro Series Manual Solar Shade.
 - 2. Bead Chains: Nickel-plated metal.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Chain tensioner, jamb mounted.
 - 3. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.

-
- a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 1. Roller Drive-End Location: As standard with manufacturer to suit installation.
 2. Direction of Shadeband Roll: Regular, from back of roller.
 3. Shadeband-to-Roller Attachment: Removable spline fitting integral channel in tube.
 - C. Mounting Hardware: Heavy duty brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
 - D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
 - E. Shadebands:
 1. Source: Roller shade manufacturer.
 2. Shadeband Material: PVC-free, TPO fabric.
 - a. RS-1: Light-filtering fabric.
 - b. RS-3: Light-blocking fabric.
 3. Shadeband Bottom (Hem) Bar: Manufacturer's standard for operating mechanism indicated.
 - a. Color and Finish of Exposed Bottom Bar: As selected by Architect from manufacturer's full range.
 - F. Installation Accessories:
 1. Exposed Headboxes and Bottom Boxes: Rectangular, extruded-aluminum enclosure including front fasciae, top and back covers, endcaps, and removable closures.
 - a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than height indicated on Drawings.
 2. Channels or Angles: Manufacturer's standard design for operating mechanism indicated and shadeband take-up and support.
 - G. Installation Accessories Color and Finish: As selected from manufacturer's full range
- 2.3 MOTOR-OPERATED, SINGLE-ROLLER SHADES (RS-2)
- A. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
 1. Basis of Design: SWF Contract; RTS Motorized Solar Shades.
 2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.
 - a. Electrical Characteristics: Single phase, 110 V, 60 Hz.
 3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:

-
- a. Individual/Group Control Station: Momentary-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for individual and group control.
 - b. Color: As selected by Architect from manufacturer's full range.
 4. Crank-Operator Override: Crank and gearbox operate shades in event of power outage or motor failure.
 5. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
 6. Operating Features:
 - a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
 - B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 1. Roller Drive-End Location: As standard with manufacturer to suit installation.
 2. Direction of Shadeband Roll: Regular, from back of roller.
 3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
 - C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.
 - D. Shadebands: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - E. Shadebands:
 1. Shadeband Material: Light-filtering fabric.
 - a. Source: Roller shade manufacturer.
 - b. Type: PVC-free, TPO fabric.
 - c. Material Openness Factor: 3 percent.
 - d. Material Color: As selected by Architect from manufacturer's full range.
 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
 - F. Installation Accessories:
 1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
 - a. Shape: L-shaped.
 - b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 3 inches.
 2. Endcap Covers: To cover exposed endcaps.
 3. Installation Accessories Color and Finish: As selected by Architect from manufacturer's full range.

2.4 ROLLER-SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
 - 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
 - 2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
- B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 122413

SECTION 123216 - MANUFACTURED PLASTIC-LAMINATE CLAD CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Plastic-laminate-faced wood cabinets of stock design.
 2. Plastic-laminate countertops.
 3. Plastic-laminate cubbies.
 4. Plastic-laminate wall shelving.

1.2 DEFINITIONS

- A. MDF: Medium-density fiberboard.
- B. Exposed Portions of Cabinets: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and surfaces visible in open cabinets.
- C. Semiexposed Portions of Cabinets: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches or more above floor are defined as semiexposed.
- D. Concealed Portions of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, and ends and backs that are placed directly against walls or other cabinets.
- E. Hardwood Plywood: A panel product composed of layers or plies of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive, and faced both front and back with hardwood veneers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show fabrication details, including types and locations of hardware. Show installation details, including field joints and filler panels. Indicate manufacturer's catalog numbers for casework.
- C. Production Drawings:
1. Manufacturer to provide CAD production drawings for casework systems and countertops. Drawings should be to scale indicating location of all architectural features: wall type, doors, and windows. Drawings should be in plan view, elevation, end, and cross-section views. All drawings should show service run spaces and location of all services.
 2. Coordinate production drawings with other work involved, provide shops drawings for all trades involved in installation of casework.
- D. Samples for Initial Selection: For cabinet finishes and for each type of top material indicated.
1. Decorative Laminate Color Charts.
 2. PVC Edge strips.

- E. Samples for Verification: 8-by-10-inch Samples for each type of finish, including top material and the following:
1. Section of countertop showing top, front edge, and backsplash construction.
 2. One full-size finished base cabinet complete with hardware, doors, and drawers, but without countertop.
 3. One full-size finished wall cabinet complete with hardware, doors, and adjustable shelves.
 4. Maintain full-size Samples at Project site during construction in an undisturbed condition as a standard for judging the completed Work. Unless otherwise indicated, approved sample units may become part of the completed Work if in undisturbed condition at time of Substantial Completion. Notify Architect of their exact locations.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain manufactured wood casework from single source from single manufacturer.
- C. Manufacturer: Manufacturer shall provide a published catalogue with all pre-engineered components illustrated and described. Manufacturer to have been in business a minimum of five (5) years, and have experience providing casework systems for similar types of projects. The manufacturer must produce evidence of financial stability, bonding capacity, and adequate facilities and personnel required to produce work of this scope.
- D. Quality Standard: Unless otherwise indicated, comply with requirements for modular cabinets in AWT's "Architectural Woodwork Quality Standards."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver manufactured wood casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified in "Project Conditions" Article.
- B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install manufactured wood casework until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of construction contiguous with manufactured wood casework by field measurements before fabrication and indicate on Shop Drawings.

1. Verify location of utility connections and indicate on Shop Drawings. Bring any discrepancies to the attention of the Architect before fabrication.

1.8 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements in walls and partitions for support of manufactured wood casework.
- B. Coordinate construction of manufactured wood casework to accommodate countertops. Obtain specifications for countertops from fabricator and provide additional framing to support weight and span of countertops material.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of manufactured wood casework that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Delamination of components or other failures of glue bond.
 - b. Warping of components.
 - c. Failure of operating hardware.
 - d. Deterioration of finishes.
 2. Warranty Period: Five years from date of Substantial Completion.

1.10 EXTRA MATERIALS

- A. Furnish complete touchup kit for each type and finish of manufactured wood casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged casework finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers, General: Casework Manufacturers listed below are pre-qualified. All other vendors must submit a substitution request form and be pre-approved by Architect ten (10) days prior to bid day, and MUST meet all Wake County requirements used to establish this manufacturer's list. Subject to compliance with requirements, provide products by one of the following or a pre-approved equal:
 1. Plastic-Laminate-Faced Manufactured Casework:
 - a. Cabinets by Design
 - b. Interior Wood Specialists
 - c. LSI Corporation.
 - d. Stevens Industries, Inc.
 - e. TMI Systems Design, Inc

2.2 MATERIALS, GENERAL

- A. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.

- B. Particleboard: ANSI A208.1, Grade M-32
- C. MDF: ANSI A208.2, Grade 130.
- D. Plastic Laminate (PLM-1 and PLM-2): High-pressure decorative laminate complying with NEMA LD 3.
 - 1. Manufacturers: Subject to compliance with requirements, provide products on Finish Legend or Architect approved comparable products by one of the following:
 - a. Formica Corporation.
 - b. Lamin-Art, Inc.
 - c. Pionite; a Panolam Surface Systems company.
 - d. Wilsonart International; Div. of Premark International, Inc. (Basis of Design)
- E. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
- F. Edgebanding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm thick.
- G. Edgebanding for Thermoset Decorative Panels: PVC or polyester edge banding complying with LMA EDG-1 and matching thermoset decorative panels.

2.3 CABINET MATERIALS

- A. Exposed Cabinet Materials:
 - 1. Plastic Laminate: Grade VGS.
 - 2. Unless otherwise indicated, provide specified edgebanding on all exposed edges.
- B. Semiexposed Cabinet Materials:
 - 1. Thermoset Decorative Panels: Provide thermoset decorative panels for semiexposed surfaces unless otherwise indicated.
 - 2. Unless otherwise indicated, provide specified edgebanding on all semiexposed edges.
- C. Concealed Cabinet Materials:
 - 1. Plastic Laminate: Grade BKL.

2.4 DESIGN, COLOR, AND FINISH

- A. Design: Provide manufactured wood casework of the following design:
 - 1. Flush overlay with wire pulls.
- B. Thermoset Decorative Panel Colors, Patterns, and Finishes: As selected from manufacturer's full range.
- C. Plastic-Laminate Colors, Patterns, and Finishes: As selected from manufacturer's full range.
- D. PVC Edgebanding Color: As selected from casework manufacturer's full range to match plastic laminate.

2.5 CABINET FABRICATION

- A. Plastic-Laminate-Faced Cabinet Construction: As required by referenced quality standard, but not less than the following:

1. Cabinet Body Construction:
 - a. Tops and bottoms are glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals. Minimum 6 dowels each joint for 24-inch deep cabinets and a minimum of 4 dowels each joint for 12-inch deep cabinets.
 - 1) Cabinet tops, bottoms and sides are 3/4-inch thick particleboard core.
 - b. Cabinet backs: Minimum 1/2-inch thick prefinished particleboard or 1/4-inch thick medium-density fiberboard fully captured four sides. Provide wall and tall cabinets with a 3/4-inch x 4 inch mounting strip used to secure the cabinet to the wall.
 - 1) Exposed back on fixed or movable cabinets: 3/4-inch particleboard with the exterior surface finished in VGS laminate as selected.
 - c. Provide the following types of base construction to support cabinet load transfer, isolate the cabinet ends from contact with floor, and permit leveling.
 - 1) Separate Sub-base: Cabinet sub-base shall be separate and continuous (no cabinet body sides-to-floor), exterior grade plywood with concealed fastening to cabinet bottom. Sub-base shall be ladder-type construction of individual front, back, and intermediates, to form a secure and level platform to which cabinets attach. Sub-base at exposed cabinet end panels shall be recessed exactly 1/4 inch from face of finished end, for flush installation of finished base material by other trades.
 - d. Base units, except sink base units: Full sub-top. Sink base units are provided with open top, a welded steel/epoxy painted sink rail, full width at top front edge, concealed behind face rail/doors, a split back removable access panel.
 - e. Side panels and vertical dividers shall receive adjustable shelf hardware at 32mm line boring centers. Mount door hinges, drawer slides and pull-out shelves in the line boring for consistent alignment.
 - f. Parting Rails between Locking Drawers: 3/4-inch-thick particleboard with balanced surfaces of cabinet liner (.020) high-pressure laminate and 1mm PVC edge. When drawer stacks are keyed individually, extend parting rail full depth of drawer.
 - g. Exposed and semi exposed edges.
 - 1) Edging: 3mm PVC.
 - h. Adjustable shelf core: Unless noted otherwise, provide 3/4-inch-thick particleboard up to 30 inches wide, 1-inch-thick particleboard over 30 inches wide. Provide plywood core shelving construction in lieu of particleboard at Art Room and Science Rooms.
 - 1) Any shelving over 30"W shall have a mid-shelf support or steel shelf stiffener
 - 2) Front edge: 3mm PVC; unless indicated otherwise.
 - 3) Front edge: 3mm PVC; exposed shelves in open interiors only.
 - i. Interior finish, units with open Interiors: Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with white thermally fused melamine.
 - j. Interior finish, units with closed Interiors: Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with cabinet liner (.020) high-pressure laminate or thermally fused melamine with matching prefinished back.
 - k. Exposed ends: Faced with VGS high-pressure decorative laminate.
 - l. Wall unit bottom: Faced with thermally fused melamine laminate color-matched to the exposed external cabinet color.
 - m. Wall and tall unit tops: Top surface is faced with thermally fused melamine laminate.
 - n. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), is not permitted.
2. Drawers:

-
- a. Sides, back and sub front: Minimum 1/2-inch-thick particleboard, laminated with cabinet liner (.020) high-pressure laminate or thermally fused melamine doweled and glued into sides. Top edge banded with 1mm PVC.
 - b. Drawer bottom: Minimum 1/2-inch-thick particleboard laminated with cabinet liner (.020) high-pressure laminate or thermally fused melamine, screwed directly to the bottom edges of drawer box.
 - c. Paper storage drawers: Minimum 3/4-inch-thick particleboard sides, back, and sub front laminated with cabinet liner (.020) high-pressure laminate or thermally fused melamine. Minimum 1/2-inch-thick particleboard drawer bottoms screwed directly to the bottom edges of the drawer box. Provide PVC angle retaining bar at the rear of the drawer.
3. Door/Drawer Fronts:
- a. Core: 3/4-inch-thick particleboard.
 - b. Provide double doors in opening in excess of 24 inches wide.
 - c. Faces: High-pressure laminate.
 - 1) Exterior: VGS High-pressure decorative laminate.
 - 2) Interior: High-pressure cabinet liner.
 - d. Door/drawer edges: 3mm PVC, external edges and outside corners machine profiled to 1/8-inch radius.
 - e. Miscellaneous Shelving:
 - 1) Core material: 3/4 inch or 1-inch particleboard to meet span requirements.
 - 2) Exterior: VGS High-pressure decorative laminate.
 - 3) Edges: 3mm PVC, edges and outside corners machine profiled to 1/8-inch radius.
- B. Leg Shoes: Vinyl or rubber, black, open-bottom type.
- C. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.
- 2.6 CASEWORK HARDWARE AND ACCESSORIES
- A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.
1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.
- B. Butt Hinges: Stainless-steel, semiconcealed, 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 hinges for doors less than 48 inches high and 3 hinges for doors more than 48 inches high.
- C. Pulls: Solid stainless-steel or chrome-plated brass wire pulls, fastened from back with two screws. For sliding doors, provide recessed stainless-steel or chrome-plated flush pulls. Provide 2 pulls for drawers more than 24 inches wide.
1. Provide brushed finish on pulls. Pulls shall comply with ADA.
- D. Door Catches: Magnetic catches, BHMA A156.9, B03141 with minimum seven pound pull, attached with screws and slotted for adjustment.
- E. Drawer Slides: BHMA A156.9, Type B05091.
1. Drawers except as noted: Slides shall be Blum Style No. BS230M with epoxy finish. Slides shall be 3/4 extension. Slides will have a 100-pound load rating at 3/4 extension and a built-in, positive

- stop both directions, with soft-closing feature. Slides shall have a lifetime warranty as offered by slide manufacturer.
2. Paper Storage and File Drawers: Slides shall have full extension. Minimum 150 lbf dynamic load rating at 50,000 cycles. Minimum 150 lb loading static edge load test rating for one-minute duration on fully extended drawer. Slides shall have a lifetime warranty as offered by slide manufacturer.
 3. Pencil drawers shall be equipped with Blum No. 320 for undercounter or support frame mounting. Slides shall have 3/4 extension.
 4. Keyboard Slides: Grade 1HD-100, for computer keyboard shelves.
- F. Label Holders: Stainless steel or chrome plated, sized to receive standard label cards approximately 1 by 2 inches, attached with screws or brads.
1. Provide label holders where indicated.
- G. Drawer and Hinged Door Locks: Cylindrical (cam) type, 5-disc tumbler, brass with chrome-plated finish, and complying with BHMA A156.11, Grade 1. Basis of Design: National Lock #M4-7054C.
1. Provide a minimum of two keys per lock and six master keys.
 2. Provide locks where indicated.
 3. Provide secure bolt or latch at inactive door on all locked cabinets.
 4. All locks in individual rooms to be keyed alike.
- H. Sliding-Door Hardware Sets: Manufacturer's standard, to suit type and size of sliding-door units.
- I. Adjustable Shelf Supports: Injection molded transparent polycarbonate friction fit into cabinet end panels and vertical dividers, adjustable on 32mm centers. Each shelf support has 2 integral support pins, 5mm diameter, to interface pre-drilled holes, and to prevent accidental rotation of support. The support automatically adapts to 3/4 inch or 1 inch shelving and provides non-tip feature for shelving. Structural load to 1200 pounds (300 pounds per support) without failure.
- J. Grommets for Cable Passage through Countertops (**GRM-1**): 2-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage. Provide color selected from manufacturer's full range to match plastic laminate.
- 2.7 COUNTERTOPS
- A. Countertops, General: Provide smooth, clean exposed tops and edges in uniform plane free of defects. Provide front and end overhang of 1 inch over base cabinets.
- B. Plastic-Laminate Tops (PLM-2): Plastic-laminate sheet, shop bonded to both sides of 1-inch plywood or particleboard. Sand surfaces to which plastic laminate is to be bonded.
1. Plastic Laminate for Flat Tops: Grade HGS.
 2. Plastic Laminate for Backing: Grade BKL.
 3. Provide one-piece countertop construction for minimum 1-inch deep front counter edge.
 - a. 1-1/8-inch-thick core material (monolithic) and 3 mm PVC edge banding.
 4. Use exterior plywood or exterior glue particleboard for countertops containing sinks.
- C. Under Counter Support Bracket: Provide heavy-duty wall-mounted counter support with a structural loading capacity of 1000 lbs per brace when installed at 16" o.c. Furniture grade, epoxy powder coated steel.

2.8 CUBBIE FABRICATION

- A. Plastic-Laminate-Faced Cubbies: As required by referenced quality standard, but not less than the following:
1. Bottoms and Ends of Cubbies: 3/4-inch particleboard, plastic-laminate faced on exposed surfaces, thermoset decorative panels on semiexposed surfaces.
 2. Shelves: 3/4-inch particleboard, plastic-laminate faced.
 3. Backs of Cubbies: 1/2-inch particleboard, plastic-laminate faced on exposed surfaces, thermoset decorative panels on semiexposed surfaces.
- B. Cubbie Hooks: Belwith P27305 or equal

2.9 WALL SHELVING

- A. Plastic-Laminate Shelving: Plastic-laminate sheet, Grade HGS, shop bonded to both sides of particleboard. Sand surfaces to which plastic laminate is to be bonded.
1. Shelf Thickness: 3/4 inch or as indicated.
 2. Edge Treatment: Finish both edges with rigid PVC extrusions, 3 mm thick, through color with satin finish.
- B. Adjustable Shelf Supports: Powder-coated steel standards and shelf brackets, complying with BHMA A156.9, Types B04102 and B04112, surface mounted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of manufactured wood casework.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CASEWORK INSTALLATION

- A. Install level, plumb, and true; shim as required, using concealed shims. Where manufactured wood casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- B. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Fasten cabinets to masonry or framing, wood blocking, or reinforcements in walls and partitions with fasteners spaced 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.
1. Where base cabinets are not installed adjacent to walls, fasten to floor at toe space with fasteners spaced 24 inches o.c. Secure sides of cabinets to floor, where they do not adjoin other cabinets, with not less than two fasteners.
- C. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, or framing, blocking, or reinforcements in walls or partitions. Align similar adjoining doors to a tolerance of 1/16 inch.

1. Fasten through back, near top and bottom, at ends, and not more than 16 inches o.c.
2. Use toggle bolts at hollow masonry.
3. Use expansion anchors at solid masonry.
4. Use No. 10 wafer-head screws sized for 1-inch penetration at wood hanging strips.
5. Use No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish at metal-framed partitions.
6. Use toggle bolts at plaster on metal lath.

D. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

E. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF TOPS

A. Field Jointing: Where possible make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

B. Secure tops to cabinets with Z- or L-type fasteners or equivalent, using two or more fasteners at each front, end, and back.

C. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.

D. Secure backsplashes and end splashes to tops with concealed metal brackets at 16 inches o.c. and walls with adhesive.

E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.4 INSTALLATION OF SHELVING

A. Securely fasten shelf standards to masonry, partition framing, wood blocking, or reinforcements in partitions.

1. Fasten shelf standards at ends and not more than 12 inches o.c.
2. Use toggle bolts at hollow masonry.
3. Use expansion anchors at solid masonry.
4. Use self-tapping sheet metal screws in metal framing or metal backing at metal-framed partitions. Do not use wall anchors in gypsum board.
5. Use toggle bolts at plaster on metal lath.

B. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Space standards not more than 30 inches o.c.

C. Install shelving level and straight, closely fitted to other work where indicated.

3.5 CLEANING AND PROTECTING

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- C. Protection: Provide 6-mil plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 123216

SECTION 123661 - SOLID SURFACING COUNTERTOPS AND SILLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Solid surface material countertops
 - 2. Solid surface material window sills.
 - 3. Countertop support brackets.

1.2 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Samples for Verification: For the following products:
 - 1. Countertop material of each type, 6 inches square.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.

1.5 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops and window sills by field measurements before window sill fabrication is complete.

1.6 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops and window sills or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP AND WINDOW SILL MATERIALS (SSM-1 AND SSM-2)

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - a. LX Hausys (Basis-of-Design).

- 1) Product: HI-MACS Solid Surface.
 - b. E. I. du Pont de Nemours and Company.
 - c. Meganite.
 - d. Formica Corporation.
 2. Type: Provide Standard type unless Special Purpose type is indicated.
 3. Colors and Patterns: As indicated in Interior Finishes Legend on Drawings.
- B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to countertop material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
1. Grade: Premium.
- B. Configuration:
1. Front: Straight, slightly eased at top with separate apron, 6 inches high, recessed 1/4-inch behind front edge.
 2. Backsplash: Straight, slightly eased at corner.
 3. End Splash: Matching backsplash.
- C. Countertops: 1/2-inch-thick, solid surface material with front edge built up with same material.
- D. Backsplashes: 1/2-inch-thick, solid surface material.
- E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
1. Fabricate with loose backsplashes for field assembly.
- F. Joints: Fabricate countertops without joints.
1. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 WINDOW SILL FABRICATION

- A. Fabricate window sills according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
1. Grade: Premium.
- B. Configuration: As indicated on Drawings.
- C. Joints: Fabricate window sills without joints.

2.4 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
- B. Sealant for Window sills: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive solid surface and quartz agglomerate material window sills and conditions under which window sills will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of window sills/countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- B. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Secure window sills to subsills with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match window sill, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- D. Install window sills level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- E. Bond joints with adhesive and draw tight as window sills are set. Mask areas of window sills adjacent to joints to prevent adhesive smears.
- F. Install metal splines in kerfs in window sill edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
- G. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661

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SECTION 129300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Seating.
2. Bicycle racks.
3. Trash receptacles.

B. Products furnished, but not installed under this Section, include anchor bolts to be installed in paving.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For units with factory-applied color finishes.

C. Samples for Verification: For each type of exposed finish required, prepared on samples of size indicated below:

1. Size: Not less than 6-inch- (152-mm-) long linear components and 4-inch- (102-mm-) square sheet components.

D. Product schedule: For site furnishings. Use same designations indicated on drawings.

E. Material Certificates: For site furnishings, signed by manufacturers.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Bench Replacement Slats: No fewer than twelve (12) full-size units for each size indicated.
2. Trash Receptacle Inner Containers: Three (3) full-size units for each size indicated, but no fewer than two (2) units.
3. Anchors: Five (5) for each applicable type of site furnishings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

- B. Storage: Store materials in clean, dry area in accordance with manufacturer's instructions. Keep materials in manufacturer's original, unopened containers and packaging until installation.
- C. Handling: Protect materials and finish during handling and installation to prevent damage.

PART 2 - PRODUCTS

2.1 BENCH

- A. Manufacturers:
 - 1. Anova Furnishings
 - 2. Approved Equal
- B. Basis of Design
 - 1. Anova Airi Stix 6' Flat Bench (AE2690STX)
- C. Frame: Cast aluminum
- D. Seat:
 - 1. Material:
 - a. Painted Steel: Perforated metal. Pattern as manufacturer standard.
 - 2. Seat Height: 17.90"
 - 3. Seat Surface Shape: Flat
 - 4. Overall Height: 17.90"
 - 5. Overall Width: 75.00"
 - 6. Overall Depth: 22.00"
 - 7. Arms: None
 - 8. Seating Configuration: Multiple units as indicated.
 - a. Straight shape.
- E. Steel Finish: color coated.
 - 1. Color: As indicated in a site furnishing schedule
- F. Graphics: copy, content, and style according to manufacturer's standard.

2.2 BICYCLE RACKS

- A. Manufacturers
 - 1. Anova Furnishings
 - 2. Approved Equal
- B. Basis of Design
 - 1. Anova Tandem Powder Coated Bike Rack, Surface Mount
- C. Bicycle Rack Construction

1. Frame: Steel.
 - a. Tubing OD: Not less than 2-3/8 inches.
 2. Style: Double-side parking
 - a. Overall Height: 32.25"
 - b. Overall Width: 35.88"
 - c. Overall Depth: 5.50:
 - d. Capacity: Designed to accommodate no fewer than two bicycles.
 3. Installation Method: Surface flange anchored at finished grade to substrate indicated
- D. Steel Finish: Color coated.
1. Color: As indicated in a site furnishing schedule.

2.3 TRASH RECEPTACLES

- A. Manufacturers
1. Anova Furnishings
 2. Approved Equal
- B. Basis of Design
1. Anova Furnishings Rendezvous 55 Gallon Trash Receptacle with Bonnet Top
- C. Steel Facing Surrounds: 12-gauge slotted steel with a 0.75" gap vertical slotted pattern.
- D. Bonnet Top: 16-gauge spun steel
- E. Support Frames: Steel welded.
- F. Trash Receptacles:
1. Receptacle Shape and Form: Round cylinder with tapered funnel top with opening for depositing trash in side of lid or top.
 2. Lids and Tops: Steel matching facing panels secured by cable or chain, hinged, swiveled, or permanently secured.
 - a. Description: Elevated flat or shallow dome rain-cap lid.
 3. Receptacle Height: 42.72"
 4. Overall Width: 31.75"
 5. Inner Container: Rigid plastic container with lift-out handles; designed to be removable and reusable.
 6. Disposable Liners: Provide receptacle designed to accommodate disposable liners.
 7. Capacity: Not less than 55 gal
 8. Service Access: Removable lid or top inner container and disposable liner lift or slide-out for emptying.
- G. Steel Finish: color coated.
1. Color: Black

2.4 Basketball Goals

- A. Manufacturers
 - 1. Bison
 - 2. Approved Equal
- B. Basis of Design
 - 1. Bison Gooseneck mega duty steel fan playground basketball system
- C. Basketball Goal Construction
 - 1. Pole shall be 5 9/16" outside diameter schedule 40 structural pipe with hot dipped galvanized finish.
 - 2. Pole style to be gooseneck and allow for 48" bury into the ground and 6' extension from the front of the pole to the face of the backboard.
 - 3. Backboard to be facined to the pole by two 1 5/8" diameter 13 gal. flow coated galvanized tubular braces for support.
 - 4. Pole shall be designed so that the rim mounts directly to the horizontal pole section through the backboard.
 - 5. Backboard shall be constructed of fiberglass with a 39" x 54" fan shaped playing surface.
 - 6. Rim shall be constructed of two 5/8" diameter AISI 1018 cold drawn carbon steel rings welded together at a minimum of 6 places.
 - 7. Net attachment system shall be of continuous type constructed of 3/16" x 1" steel with punched net attachment slots suitable for nylon nets.
 - 8. Nets to be nylon.
 - 9. Mounting hardware per manufacturer specifications.

2.5 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:
 - 1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
 - 2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - 3. Structural Pipe and Tube: ASTM B 429/B 429M.
 - 4. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - 5. Castings: ASTM B 26/B 26M.
- B. Steel and Iron: Free of surface blemishes and complying with the following:
 - 1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53/A 53M, or electric-resistance-welded pipe complying with ASTM A 135/A 135M.
 - 3. Tubing: Cold-formed steel tubing complying with ASTM A 500/A 500M.
 - 4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513/A 513M, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500/A 500M; zinc coated internally and externally.
 - 5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.
 - 6. Perforated Metal: From steel sheet not less than 0.075-inch (1.9-mm) nominal thickness; manufacturer's standard perforation pattern.
 - 7. Expanded Metal: Carbon-steel sheets, deburred after expansion, and complying with ASTM F 1267.

8. Malleable-Iron Castings: ASTM A 47/A 47M, grade as recommended by fabricator for type of use intended.
 9. Gray-Iron Castings: ASTM A 48/A 48M, Class 200.
- C. Stainless Steel: Free of surface blemishes and complying with the following:
1. Sheet, Strip, Plate, and Flat Bars: ASTM A 666.
 2. Pipe: Schedule 40 steel pipe complying with ASTM A 312/A 312M.
 3. Tubing: ASTM A 554.
- D. Fiberglass: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.
- E. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.
1. Polyethylene: Fabricated from virgin plastic HDPE resin.
- F. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality, tamperproof, vandal and theft resistant, concealed, recessed, and capped or plugged.
- G. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M; recommended in writing by manufacturer, for exterior applications.
- H. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.
- I. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil (0.0076 mm) thick.
 2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

2.6 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment: Pressure-treat wood according to AWPA U1, Use Category UC3b, and the following:
1. Use preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 2. Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent. Do not use materials that are warped or do not comply with requirements for untreated materials.

2.7 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPAC M4 to cut surfaces.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- F. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.8 ALUMINUM FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.9 STEEL AND GALVANIZED-STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.
- B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

2.10 IRON FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.11 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run directional finishes with long dimension of each piece.
2. Directional Satin Finish: No 4.
3. Dull Satin Finish: No. 6.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch (19 mm) larger than OD of post. 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, with top smoothed and shaped to shed water.
- F. Pipe Sleeves: 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, with top smoothed and shaped to shed water.

3.3 ADJUSTING

- A. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- B. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 CLEANING

- A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

3.5 PROTECTION

- A. Protect installed furnishings to ensure that, except for normal weathering, they will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 129300

SECTION 142400 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes hydraulic passenger elevators.

1.2 DEFINITIONS

- A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

1.3 ACTION SUBMITTALS

- A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures, hoistway entrances, and operation, control, and signal systems.
- B. Non-Proprietary Equipment Affidavit: Submit non-proprietary equipment affidavit with equipment submittals.
- C. Shop Drawings:
 - 1. Include plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment.
 - 2. Include large-scale layout of car-control station.
 - 3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
- D. Samples for Initial Selection: For finishes involving color selection.
- E. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; 3-inch-square Samples of sheet materials; and 4-inch lengths of running trim members.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

- D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard one-year maintenance agreement, beginning at the date of Final Acceptance by Owner of each elevator. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.8 COORDINATION

- A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.
- B. Coordinate locations and dimensions of other work relating to hydraulic elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.9 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
 - 2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or an approved comparable product by one of the following:
1. TK Elevator (Basis-of-Design).
 - a. Product: Endura Hydraulic.
 2. Schindler Elevator.
 3. Delaware Elevator.
 4. Minnesota Elevator.
- B. Source Limitations: Obtain elevators from single manufacturer.
1. Major elevator components, including pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.
- B. Accessibility Requirements: Comply with Section 407 in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.
- C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and shall comply with elevator safety requirements for seismic risk Zone 2 or greater in ASME A17.1/CSA B44.
1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified."
 2. Affected peak velocity acceleration (A_v) for Project's location is indicated on Structural Drawings.
 3. Provide earthquake equipment required by ASME A17.1/CSA B44.
 4. Provide seismic switch required by ASCE/SEI 7.
 5. Seismic Design Criteria: As indicated on Structural Drawings.
 - a. Design earthquake spectral response acceleration short period (Sds).
 - b. Project's Seismic Design Category.
 6. Elevator Component Importance Factor: 1.5.

2.3 ELEVATORS

- A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturers' standard components shall be used, as included in standard elevator systems and as required for complete system.
1. Telescopic, inverted jacks, or machine-room-less elevators are not permitted.
- B. Elevator Description:
1. Type: Hydraulic.
 2. Capacity: 4500 lbs, minimum.
 3. Car Platform Style: Hospital; minimum 60" W by 94" D.

4. Rated Speed: 125 fpm.
5. Operation System: Simplex selective collective.
6. Auxiliary Operations:
 - a. Battery-powered lowering.
7. Car Enclosures:
 - a. Front Walls (Return Panels): Satin stainless steel, No. 4 finish with integral car door frames.
 - b. Car Fixtures: Satin stainless steel, No. 4 finish.
 - c. Side and Rear Wall Panels (WPE-1): Plastic laminate, as indicated on Finish Legend or approved equal.
 - d. Reveals: Satin stainless steel, No. 4 finish.
 - e. Door Faces (Interior): Satin stainless steel, No. 4 finish.
 - f. Door Sills: Aluminum, mill finish.
 - g. Ceiling: Luminous ceiling.
 - h. Handrails: 3/8" by 2" rectangular satin stainless steel, No. 4 finish, at sides and rear of car.
 - i. Floor prepared to receive tile carpet flooring (specified in Section 096813 "Tile Carpeting").
8. Hoistway Entrances:
 - a. Width: 42 inches minimum.
 - b. Height: 84 inches minimum.
 - c. Type: Two-speed center opening.
 - d. Frames: Satin stainless steel, No. 4 finish.
 - e. Doors: Satin stainless steel, No. 4 finish.
 - f. Sills: Aluminum, mill finish.
9. Hall Fixtures: Satin stainless steel, No. 4 finish.
10. Additional Requirements:
 - a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.
 - b. Provide exhaust fan two speed with aluminum grill.
 - c. Provide hooks for protective pads and one complete set(s) of full-height protective pads.

2.4 SYSTEMS AND COMPONENTS

- A. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations.
 1. Pump shall be submersible type with submersible squirrel-cage induction motor, and shall be suspended inside oil tank from vibration isolation mounts or shall be tank-top-mounted type with fan-cooled, squirrel-cage induction motor, and shall be mounted on oil tank with vibration isolation mounts and enclosed in prime-painted steel enclosure lined with 1-inch-thick, glass-fiber insulation board.
 2. Oil control unit: Single unit valve assembly with low-pressure switch.
 3. Motor shall have wye-delta or solid-state starting.
 4. Motor shall have variable-voltage, variable-frequency control.
- B. Hydraulic Silencers: System shall have hydraulic silencer containing pulsation-absorbing material in blowout-proof housing at pump unit.
- C. Piping: Size, type, and weight of piping as recommended by elevator manufacturer, with flexible connectors to minimize sound and vibration transmissions from power unit.
 1. Cylinder units shall be connected with dielectric couplings.
 2. Casing for Underground Piping: Schedule 40 PVC pipe complying with ASTM D 1785, joined with PVC fittings complying with ASTM D 2466 and solvent cement complying with ASTM D 2564.

- D. Hydraulic Fluid: Nontoxic, readily biodegradable made from vegetable oil with antioxidant, anticorrosive, antifoaming, and metal-passivating additives. Hydraulic fluid is approved by elevator manufacturer for use with elevator equipment.
- E. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.
- F. Protective Cylinder Casing: PVC or HDPE pipe casing complying with ASME A17.1, of sufficient size to provide not less than 1-inch clearance from cylinder and extending above pit floor. Provide means to monitor casing effectiveness to comply with ASME A17.1.
- G. Car Frame and Platform: Welded or bolted steel units.
- H. Guides: Roller guides; polymer-coated, nonlubricated sliding guides; or sliding guides with guide-rail lubricators. Provide guides at top and bottom of car and counterweight frames.

2.5 MACHINE ROOM EQUIPMENT

- A. Power Unit
 - 1. Electro-Hydraulic
 - 2. Self-contained - all components inside tank
 - 3. Motor - submersible type, especially designed for hydraulic elevator duty.
 - a. Built in thermal contact to signal over heat condition
 - 4. Pump - Positive displacement type
 - 5. Oil control unit - single unit valve assembly with low-pressure switch
 - 6. Sound isolation
 - a. Between motor frame and tank
 - b. Isolation pads under power unit
 - c. Silencer device build into power unit
- B. Motor Starter
 - 1. Solid State Elevator Starter
 - 2. Overload Contacts
- C. Controller
 - 1. Microprocessor type that meets all current application codes – Equipment and component systems shall not employ any proprietary designs that could hamper and/or otherwise prohibit subsequent maintenance, repairs, or adjustments by all qualified contractors.
 - a. Manufacturers of apparatus shall provide parts replacement on open market to all maintenance providers for equipment and component systems for as long as said parts are available to ensure apparatus or systems remain maintainable regardless of who may be selected for future service.
 - 2. Other Functions to be included:
 - a. Reverse phase relay
 - b. UL Label on controller
 - c. Independent Service operation
 - d. Firefighters service phase I and II
 - e. Hoistway access switches at top and bottom landings
 - 3. Approved Controller Manufacturers:

- a. Galaxy Controls
- b. Motion Controlled Engineering (MCE)
- c. SmartRise Engineering
- d. Virginia Controls

2.6 OPERATION SYSTEMS

- A. General: Provide manufacturer's standard microprocessor operation system as required to provide type of operation indicated.
- B. Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators where indicated:
 1. Single-Car Battery-Powered Lowering: When power fails, car is lowered to the lowest floor, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.

2.7 DOOR REOPENING DEVICES

- A. Programmable and adjustable parameters for door operation.
- B. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.
- C. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.8 CAR ENCLOSURES

- A. General: Provide enameled-steel car enclosures to receive removable wall panels, with car roof, access doors, power door operators, and ventilation.
 1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.
- B. Materials and Finishes: Manufacturer's standards, but not less than the following:
 1. Subfloor: Exterior, underlayment grade plywood, not less than 5/8-inch nominal thickness.
 2. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to manufacturer's standard honeycomb core with plastic-laminate panel backing and manufacturer's standard protective edge trim. Panels have a flame-spread index of 25 or less, when tested according to ASTM E 84. Plastic-laminate color, texture, and pattern as selected by Architect from plastic-laminate manufacturer's full range.
 3. Fabricate car with recesses and cutouts for signal equipment.
 4. Fabricate car door frame integrally with front wall of car.
 5. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
 6. Sight Guards: Provide sight guards on car doors.
 7. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
 8. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent acrylic or other permanent rigid plastic.
 9. Handrails: Manufacturer's standard handrails, of shape, metal, and finish indicated.

2.9 HOISTWAY ENTRANCES

- A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.
1. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.
- B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible according to NFPA 252.
1. Fire-Protection Rating: As indicated.
- C. Materials and Fabrication: Manufacturer's standards, but not less than the following:
1. Enameled-Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied enamel finish; colors as selected by Architect from manufacturer's full range.
 2. Primed-Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied, rust-resistant primer for field painting.
 3. Stainless-Steel Frames: Formed from stainless-steel sheet.
 4. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than 3 inches high, on both inside surfaces of hoistway door frames.
 5. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
 6. Sight Guards: Provide sight guards on doors matching door edges.
 7. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
 8. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.

2.10 SIGNAL EQUIPMENT

- A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with long-life lamps and acrylic or other permanent, non-yellowing translucent plastic diffusers or LEDs.
- B. Car-Control Stations: Provide manufacturer's standard recessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.
1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
 2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
- C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
1. Provide a visual communication system for the hearing impaired to comply with ASME A17.1-2019 and IBC 2018.
- D. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in
- E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.

- F. Hall Push-Button Stations: Provide one hall push-button station at each landing.
 - 1. Equip units with buttons for calling elevator and for indicating applicable direction of travel.
- G. Hall Annunciator: Provide audible signals indicating car. Signals sound once for up and twice for down.
 - 1. Place audible signals on cars.

2.11 FINISH MATERIALS

- A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B, exposed, matte finish.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, commercial steel, Type B, pickled.
- D. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.
- E. Stainless-Steel Bars: ASTM A 276, Type 304.
- F. Aluminum Extrusions: ASTM B 221, Alloy 6063.
- G. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications and Type BKV for panel backing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.
- B. 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

- A. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor and braced at intervals as needed to maintain alignment. Anchor cylinder guides at spacing needed to maintain alignment and avoid overstressing guides.
- B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS workmanship and welding operator qualification standards.
- C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.
- D. Install piping above the floor, where possible. Install underground piping in casing.

- E. Lubricate operating parts of systems as recommended by manufacturers.
- F. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- G. Leveling Tolerance: 1/4 inch, up or down, regardless of load and travel direction.
- H. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- I. Locate hall signal equipment for elevators as follows, unless otherwise indicated:
 - 1. Place hall lanterns either above or beside each hoistway entrance.
 - 2. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

- A. Temporary Use: The elevator shall not be used for temporary service or for any other purposes prior to completion and acceptance by the Owner.

3.5 DEMONSTRATION

- A. A factory-authorized service representative shall perform a minimum of 8 hours 22 training to the Owner's building and maintenance staff. Proper use, operation, 23 and fire service test shall be demonstrated at this time.
- B. The Contractor shall make a final check of the elevator operation with the Owner's maintenance personnel present. The Contractor shall ensure that the Owner has all necessary keys and manuals.

3.6 MAINTENANCE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance during normal working hours.
 - 2. Perform emergency callback service during normal working hours with response time of two hours or less.
 - 3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of two hours or less.

END OF SECTION 142400



NON-PROPRIETARY EQUIPMENT AFFIDAVIT

The elevator control equipment proposed for the project identified below shall be Non-Proprietary. The following provisions comprise a warranty representing compliance with the established standards for Universal Serviceability and Maintainability.

Equipment Purchase Unrestricted: Any elevator company shall be allowed to purchase and install this equipment.

Spare Parts: Spare parts shall be available for sale or replacement or stock to be maintained at the building site, or the offices of any elevator contractor designated by the building owner to maintain their equipment.

- No exchange-only provisions shall limit any parts purchase.
- No building owner approval shall be required to processing any parts order.
- A published price list shall establish reasonable list pricing for parts.

Diagnostics: The control system shall be provided together with all diagnostic tool functions, either onboard or in a separate device.

- Such maintenance, adjustment and troubleshooting device or system shall provide unrestricted access to all parameters, levels of adjustment, and flags necessary for maintenance of equipment.
- No expiring software, degrading operation, or key shall be accepted. Any lost or damaged tool shall be replaced or repaired at a reasonable cost.

Training: Factory and/or on-site training shall be available from the original equipment manufacturer for enrollment by anyone who wishes to learn about the installation, adjustment, maintenance, and troubleshooting the equipment. Training fees shall be reasonable and appropriate.

Technical Support Hotline: A technical support hotline shall be provided by the original equipment manufacturer whereby anyone designated by the building owner shall be able to obtain assistance for installation, adjustment, maintenance or troubleshooting.

Engineering Support: The original equipment manufacturer shall provide engineering support to any maintaining contractor so designated by the building owner.

Documentation: Manuals, engineering drawings, circuit diagrams, and prints shall be provided with the equipment at time of delivery. All documentation shall be available for replacement purchase, at a reasonable cost, by any installing or maintaining elevator contractor or persons so designated by the building owner.

AFFIRMATION:

The undersigned swears and affirms that the conditions described above are hereby made a part of the equipment proposal. The building owner, elevator contractor, and/or consultant shall reasonably rely upon these provisions.

Project

Installing Company Officer Signature Date

Controller Manufacturer

Printed Name and Title

