



DLR Group

Architecture

Engineering

Planning

Interiors

Leavenworth Intermediate Center

Leavenworth Unified School District No. 453

Leavenworth, Kansas

Building Package

Bid Set – Volume 2 of 3

DLR Group Project No. 12-18101-00

December 18, 2018

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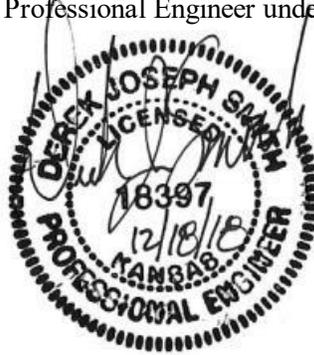
I hereby certify that this specification was prepared by me or under my direct supervision
and that I am a duly Licensed Architect under the laws of the State of Kansas.



Robyn O'Roark

License No. 5679

I hereby certify that this specification was prepared by me or under my direct supervision
and that I am a duly Licensed Professional Engineer under the laws of the State of Kansas.



Derek J. Smith

License No. 18397

I hereby certify that this specification was prepared by me or under my direct supervision
and that I am a duly Licensed Professional Engineer under the laws of the State of Kansas.



Shawn D. Cochran

License No. 21909

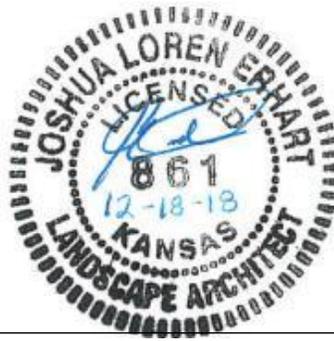
I hereby certify that this specification was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Kansas.



Troy D. Thompson

License No. 14526

I hereby certify that this specification was prepared by me or under my direct supervision and that I am a duly Licensed Landscape Architect under the laws of the State of Kansas.



Joshua Erhart

License No. 861

I hereby certify that this specification was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Kansas.



James D. Ratley

License No. 21727

END OF SECTION 000105

DOCUMENT 000115 - LIST OF DRAWING SHEETS

1.1 LIST OF DRAWINGS

A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled Leavenworth Intermediate Center, dated December 14, 2018 as modified by subsequent Addenda and Contract modifications.

B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

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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 but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. A geotechnical investigation and soil-boring data report for Project, prepared by Intertek-PSI, dated August 31, 2018, is attached herein, for Bidders' reference.
- C. Related Requirements:
 - 1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
 - 2. Document 003119 "Existing Condition Information" for information about existing conditions that is made available to bidders.

END OF DOCUMENT 003132



August 31, 2018

Dr. Mike Roth
Leavenworth USD No. 453
200 North 4th Street
Leavenworth, Kansas 66048

Re: Geotechnical Engineering Services Report
Richard W. Warren Middle School
3501 New Lawrence Road
Leavenworth, Kansas
PSI Project Number: 03381778

Dear Dr. Roth:

Thank you for choosing Professional Service Industries, Inc. (PSI), an Intertek company, as your consultant for the proposed Richard W Warren Middle School project. Per your authorization, PSI has completed a geotechnical engineering study for the referenced project. The results of the study are discussed in the accompanying report, two copies of which are enclosed.

Should there be questions pertaining to this report, please contact our office at (913) 310-1600. PSI would be pleased to continue providing geotechnical services throughout the implementation of the project, and we look forward to working with you and your organization on this and future projects.

Respectfully submitted,
Professional Service Industries, Inc.

AJ Rahman
Department Manager
Geotechnical Services

Kelly E. Rotert, PE, DBIA
Vice President

Distribution: (2 hard copies, 1 copy via email)





**Geotechnical Services Report
Richard W. Warren Middle School
3501 New Lawrence Road
Leavenworth, Kansas
PSI Report No. 03381778
August 31, 2018**

Geotechnical Engineering
Services Report

for the
Richard W. Warren Middle School
3501 New Lawrence Road
Leavenworth, Kansas

Prepared for

Leavenworth USD No. 453
200 North 4th Street
Leavenworth, Kansas 66048

Prepared by

Professional Service Industries, Inc.
1211 West Cambridge Circle Drive
Kansas City, Kansas 66103

August 31, 2018

PSI Project 0338-1778



Darrin Wilson, G.I.T.
Project Geologist
Geotechnical Services

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Staff Engineer
Geotechnical Services

Reviewed by:
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PROJECT INFORMATION

Project Authorization

The following table summarizes, in chronological order, the Project Authorization History for the services performed and represented in this report by Professional Service Industries, Inc. (PSI).

| PROJECT TITLE: RICHARD W. WARREN MIDDLE SCHOOL – LEAVENWORTH, KS | | |
|---|-------------|-----------------------------------|
| Document and Reference Number | Date | Requested/Provided By |
| Request for Proposal | 6/25/2018 | Richard Terry of DLR Group |
| PSI Proposal Number: 338249219 | 7/2/2018 | AJ Rahman and Kelly Rotert of PSI |
| Notice to Proceed | 7/12/2018 | Richard Terry of DLR Group |

Project Description

PSI understands that the project includes construction of a 70,000 square-foot building addition on the northeast side of the existing building and will connect to the existing building by way of a bridge spanning over an existing drainage ditch. The building addition will include a gymnasium that will be designed as a high wind shelter area.

PSI was also informed by Mr. Richard Terry of DLR Group that the existing school has experienced some floor slab and foundation distress. PSI was also informed that they previously experienced water issues during construction of the existing school building. In addition, it was noted that a new separation was observed in the science lab that’s is located on southern portion of the existing building. An evaluation of the existing building was outside the scope of work for this exploration and report. PSI was presented the conditions of the existing school to provide recommendations and consideration for shallow groundwater if encountered during construction.

The following table lists the material and information provided for this project:

| DESCRIPTION OF MATERIAL | PROVIDER/SOURCE | DATED |
|--|------------------------|--------------|
| Warren MS updated Concept boring locations | MKEC Engineering | 7/12/18 |

The following table lists the structural loads and site features that are required for or are the design basis for the conclusions of this report:





| STRUCTURAL LOAD/PROPERTY | REQUIREMENT/REPORT BASIS | | |
|---|---|-----------|-----------|
| BUILDING | | | |
| | | R* | B* |
| Maximum Column Loads | 250 kips | X | |
| Maximum Wall Loads | 5 kips per linear foot | X | |
| Gymnasium Wall Loads | 12 kip per linear foot | X | |
| Finish Floor Elevation and type | Grade-supported Slab | | X |
| Maximum Floor Loads | 150 psf | | X |
| Settlement Tolerances | 1 inch total, ¼ inch differential | | X |
| PAVEMENTS | | | |
| Pavement 18-kip ESAL (cycle & duration) | Light Duty 30,000 ESAL, Heavy Duty 500,000 ESAL; with a life expectancy of 20 years | | X |
| GRADING | | | |
| Planned grade variations at site, Feet | 5 to 8 feet | | X |

*"R" = Requirement indicates specific design information was supplied.

"B" = Report Basis indicates specific design information was not supplied; therefore, this report is based on this parameter.

The following image of the site plan was provided to PSI for the preparation of this project:

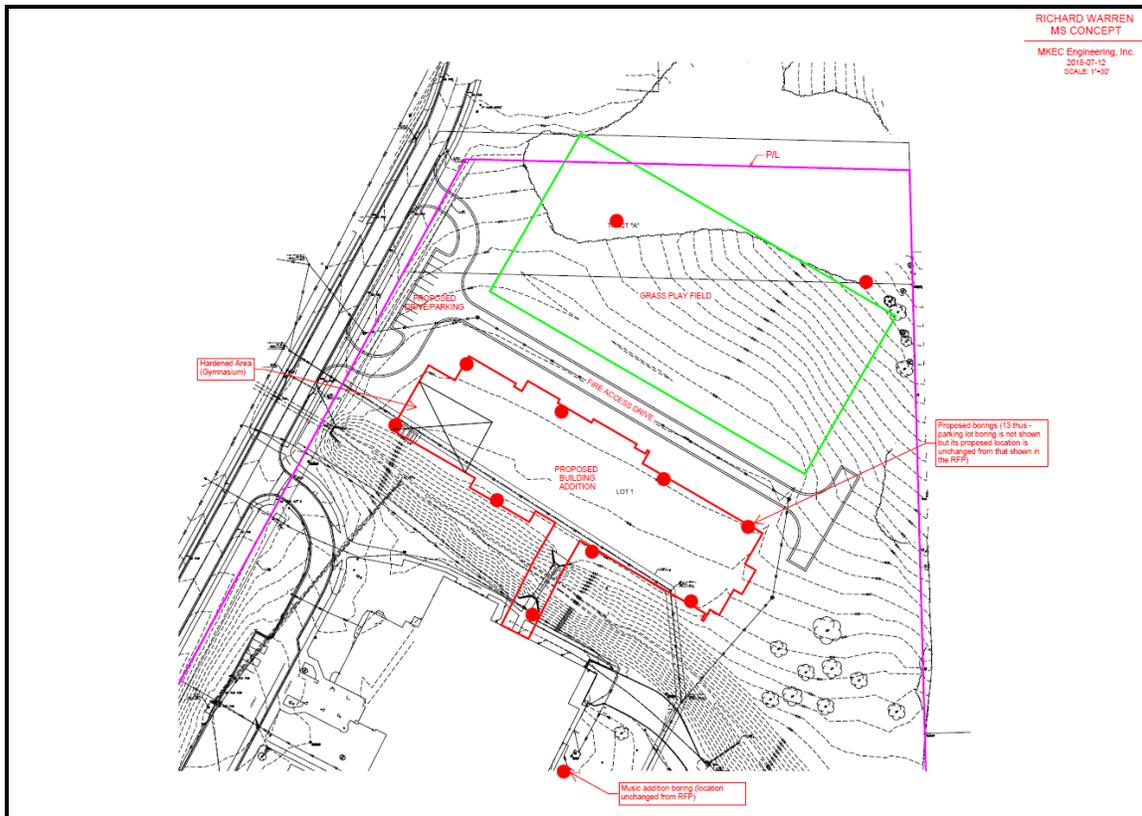


Figure 1. Preliminary Site Plan





The geotechnical recommendations presented in this report are based on the available project information, building location, and the subsurface materials described in this report. If the noted information is incorrect, please inform PSI in writing so that we may amend the recommendations presented in this report if appropriate and if desired by the client. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions within the site to evaluate and provide recommendations for site preparation and grading and for design of foundation and pavement section systems for the proposed construction. PSI's contracted scope of services included drilling thirteen (13) soil test borings at the site, select laboratory testing, and preparation of this geotechnical report. This report briefly outlines the testing procedures, presents available project information, describes the site and subsurface conditions, and presents recommendations regarding the following:

- A summary of the project information.
- A summary description of the site and subsurface conditions.
- Depths of bedrock across the site if encountered.
- An evaluation of the data as it relates to the proposed site development.
- Recommendations for site preparation, including placement and compaction of fill soils.
- Geotechnical recommendations to support foundations and floor slabs.
- Lateral analyses of deep foundations at four shear loads for a maximum of 4 pier diameters.
- Recommendations for light, medium and heavy-duty pavement section thicknesses for client-provided traffic loading or the ESAL stated in this proposal.
- Recommendations for site coefficient for use in seismic design (IBC 2012).
- Recommendations for lateral earth pressures for use in design of below grade walls for active, passive and at rest conditions.
- Comments and recommendations relating to other observed geotechnical conditions which could impact construction and site development.
- Recommended frost depth for foundations.
- Subgrade treatment and/or preparation for slab-on-grade floor slabs or pavements.
- Groundwater levels encountered.
- Recommendations and treatments of expansive soils if encountered.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air on, below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes. PSI's scope also did not provide any service to investigate or detect the presence of moisture, mold or other biological contaminants in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence or the amplification of the same. Client should be aware that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture.





SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The site for the proposed Richard Warren Middle School project is located at 3501 New Lawrence Road in Leavenworth, Kansas. The property is bordered by a residential area followed by Wildwood Street to the north, Gatewood Street to the south, a residential area to the east, and New Lawrence Road to the west. At the time of drilling, the site was covered with grass. The site had visual difference in elevation of about 10 feet and generally slopes downward in direction from the north side of the site to the south side of the site. The site latitude and longitude are approximately 39.2844° and -94.9325° , respectively. The following is an aerial image from 2018 and generally illustrates the site conditions at the time of drilling:



Figure 2. Aerial Site Photo – April 2018

Geology

According to the Kansas Geological Survey – 1998 Geologic Map of Leavenworth County, Kansas, the bedrock of the subject area belongs to the Stranger Formations, which consists of cyclic deposits of shale, sandstone, and limestone with some coal deposits.



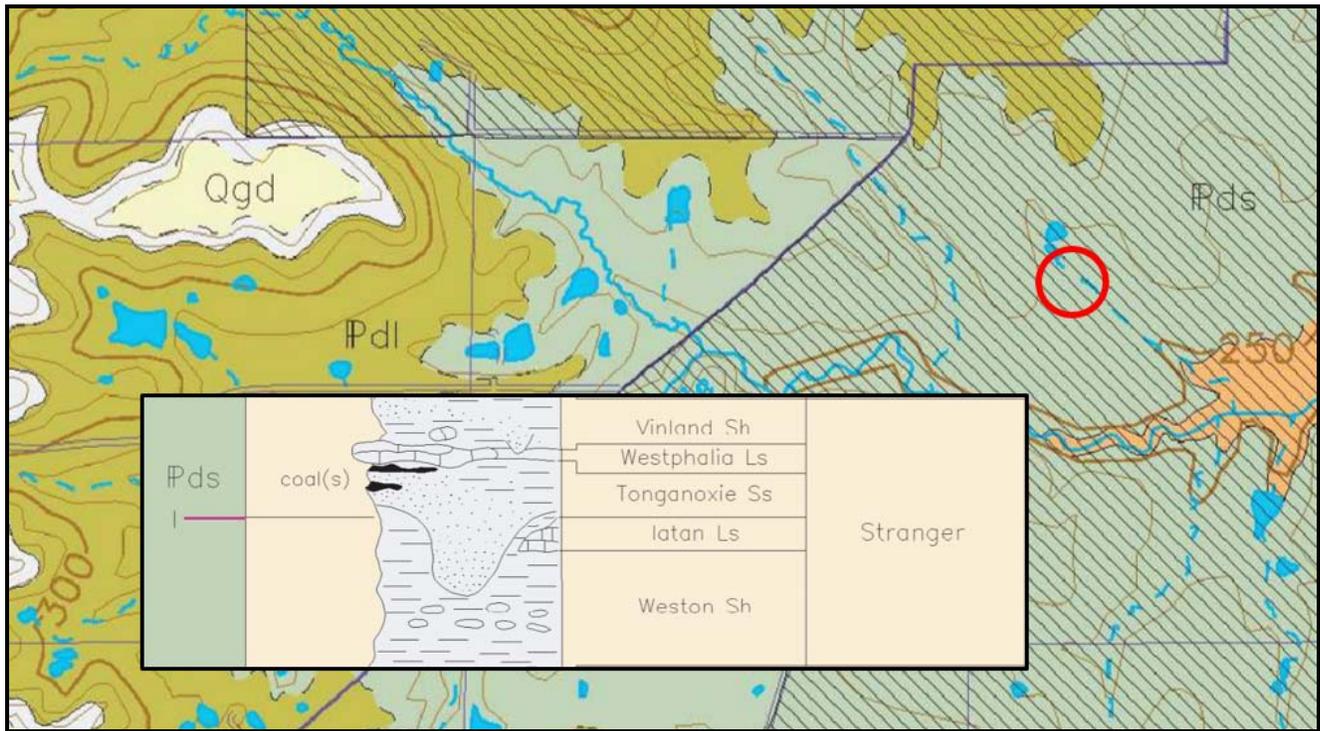


Figure 4. Kansas Geological Survey – 1998 Geologic Map of Leavenworth County, Kansas

Exploration Procedures and Subsurface Condition

The soil borings were performed with an ATV-mounted drill rig and were advanced using 3¼-inch inside diameter hollow-stem augers. Representative samples were obtained employing split-spoon and thin-wall tube sampling procedures in general accordance with ASTM procedures. The laboratory testing program was conducted in general accordance with applicable ASTM specifications. The results of these tests are to be found on the accompanying boring logs located in the Appendix.

Subsurface Conditions

The site subsurface conditions were explored with 13 soil test borings. Nine (9) these borings were drilled within the proposed gymnasium building addition area, one (1) boring was drilled within the proposed music addition, two (2) borings were drilled within the grass play field, and one (1) boring was drilled within the parking lot. Gymnasium building boring depths ranged from 17 feet to 20 feet, the music addition boring was approximately 15 feet, and the play area and parking lot borings ranged from 5 feet to 20 feet. The boring locations were suggested by PSI and reviewed with the client prior to drilling. PSI personnel staked the borings in the field by measuring distances from available surface features.

An organic layer was encountered at the surface of the borings. In general, the thickness of the organic layer ranged from 2 inches to 6 inches. The soils encountered at the 13 borings beneath the organic layer primarily included fine-grained soils that extended to the terminal depths of the borings. Based on results of Atterberg limits and visual classification, the soils were classified as medium to high plasticity clay in accordance with the Unified Soil Classification System (USCS).

The following table briefly summarizes the range of results from the field and laboratory testing programs. Please refer to the attached boring logs and laboratory data sheets for more specific information:





| RICHARD WARREN MIDDLE SCHOOL ADDITIONS | Approximate Depths Encountered (ft.) | RANGE OF PROPERTY VALUES | | | | | |
|--|---|--|---------------------|-------------------------|---|-----------------|------------------|
| | | Standard Penetration, N ₆₀ | Moisture Content, % | Dry Unit Weight, pcf | Unconfined Compressive Strength, Qu (tsf) | Liquid Limit, % | Plastic Limit, % |
| SOIL STRATA TYPE | | | | | | | |
| Possible Fill | 0-2½ | 10 | 17 | --- | --- | --- | --- |
| Medium Plasticity Clay | 0-9 | 8-21 | 17-26 | 111 | 1.6 | 41-46 | 19-20 |
| High Plasticity Clay | 5-20 | 4-16 | 13-29 | 100 | 2.2 | 56 | 20 |
| Shale | 14-20 | 25-SSR | 12-21 | --- | --- | --- | --- |
| Sandy High Plasticity Clay | 13½-18½ | 6 | 21-26 | --- | --- | --- | --- |

SSR= Split spoon refusal materials are defined as materials that cannot be penetrated with a standard split spoon using ordinary effort (greater than 50 blows per 6 inches)

Auger refusal materials were encountered within the 2 of the 13 borings at depths ranging from about 15 feet at boring B-12 to 17 feet at boring B-11. Refusal is a designation applied to materials that cannot be further penetrated by the power auger with ordinary effort and is normally indicative of a very hard or very dense material, such as boulders or gravel lenses or the upper surface of bedrock. Rock coring was beyond the scope of this exploration; therefore, the character and continuity of the refusal materials could not be determined

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring logs included in the Appendix should be reviewed for specific information at individual boring locations. These records include soil/rock descriptions, stratifications, penetration resistances, and locations of the samples and laboratory test data. The stratifications shown on the boring logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual. Water level information obtained during field operations is also shown on these boring logs. The samples that were not altered by laboratory testing will be retained for sixty (60) days from the date of this report and then will be discarded.

Water Level Measurements

Free water was observed in borings B3, B-4, B-6, B-9, B-10 and B-11 and was measured at depths between 10 and 18½ feet. Free groundwater was not observed in the remaining borings upon completion, indicating that groundwater at the site at the time of the exploration was either below the terminated depths of the borings, or that the soils encountered are relatively impermeable. Although free water was not encountered at this time, water can be present within the depths explored during other times of the year depending upon climatic and rainfall conditions. However, it should be noted that saturated soils were identified during laboratory analysis at depths as shallow as 8 feet below the ground surface. Additionally, discontinuous zones of perched water may exist within the overburden materials and should be expected at the contact with bedrock. The water level measurements presented in this report are the levels that were measured at the time of PSI’s field activities.





| Boring Number | Water Depth During Drilling (feet) | Water Depth Upon Completion (feet) | Water Depth at after 24 hours of Completion (feet) |
|---------------|------------------------------------|------------------------------------|--|
| B-1 | NA | NA | NA |
| B-2 | NA | NA | NA |
| B-3 | 16½ | 16½ | 11½ |
| B-4 | 18½ | 18½ | 11½ |
| B-5 | NA | NA | NA |
| B-6 | 14 | 14 | 8 |
| B-7 | NA | NA | 10½ |
| B-8 | NA | NA | 13½ |
| B-9 | 18½ | 11 | 10 |
| B-10 | NA | NA | 12 |
| B-11 | 17 | 13 | 10 |
| B-12 | NA | NA | NA |
| B-13 | NA | NA | NA |

GEOTECHNICAL EVALUATION

Geotechnical Discussion

There are 5 primary geotechnical characteristics at this site, which will affect the selection and performance of the foundations for this structure and the development of the site. The following summarizes those concerns:

1. The shear strength and compressibility of the upper soils will control the behavior of the proposed structure.
2. Differential settlement between the existing building and the proposed additions.
3. Medium plasticity clays were encountered in the exploration that could require remediation.
4. Relatively wet and moisture sensitive soils were encountered in the upper parts of the borings and equipment mobility difficulty may be anticipated.
5. Drying of some of the on-site soils may be required to achieve proper compaction during grading.

Shear Strength and Compressibility of Soil

The primary geotechnical property controlling the bearing capacity and compressibility of the soils bearing the applied loads is the shear strength of the clay soil. Based on 2 feet of cut or fill and a shallow foundation bearing at a depth of 3 feet below exterior or adjacent grades, the applied foundation load on a shallow foundation up to 4 feet wide will be distributed through the 8 to 12 feet of soil generally beneath the footing. PSI believes the shear strength of the soils in this zone ranges from 900 psf to 1500 psf, with shear strength exceeding 2,500 psf in the shale zones. PSI anticipates that an engineered fill placed as recommend in this report would have a minimum shear strength of 1,800 psf. This shear strength is considered “undrained” or a “total stress” parameter and will be used in conjunction with other physical and geometric parameters to calculate an allowable bearing capacity.

Differential Settlement

New footings adjacent to the existing buildings should be placed at the same elevation as the existing soil bearing foundations. Based on the soils encountered for the proposed new construction, the soils at a depth





of about 3 to 5 feet below the existing grade are suitable to support the proposed structures (please see foundation section for allowable bearing capacities). However, differential settlement between the new and existing construction should be expected. Construction joints should be provided between the existing building and the additions.

Medium Plasticity Clay

Medium plasticity clays are present in the project area that may expand and shrink thereby impacting the proposed construction. Where these soils are within about two feet of lightly loaded structural features or slabs and 1 foot of pavements, remediation is recommended or class "C" flyash or lime-treatment of the high plastic clays can be performed. Class "C" flyash or lime-treatment of the high plastic clay would reduce the plasticity index, improve workability, promote drying, and reduce shrink/swell potential. Lightly loaded structures are defined as having normal operating loads of less than 2 kips per linear foot for walls and 50 kips for columns. Medium plasticity clays have the potential for volume change with changes in the soil moisture content. In severe cases, movement and distress to footings and foundation walls can occur, although a severe case is not obviously apparent at this site. Remedial measures are recommended in select areas of the site to reduce the shrink/swell potential. Grading the subgrade to drain and not trap water below the slabs and pavements is recommended to further reduce the potential of distress from these soils.

Equipment Mobility

The presence of wet, potentially moisture sensitive shallow soils will increase the difficulty of site grading. PSI has been involved with projects in this region where these soils can undergo a loss of stability during wetter portions of the year. PSI anticipates that the soils at their current moisture levels will become easily disturbed if subjected to conventional rubber tire or narrow track-type equipment resulting in a loss of strength and characteristic "pumping". Soils that become disturbed would need to be excavated and replaced; however, this remedial excavation may expose progressively wetter soils with depth, thus compounding the condition. Thus, a normal approach to subgrade preparation may not be possible. In the event these conditions are observed, PSI recommends that the following remediation procedures be considered to further stabilize wet/soft areas if typical surface moisture conditioning/disking/recompacting methods are not effective.

1. Track in 3 to 5-inch minus well-graded crushed limestone or similar material into the failing areas to attempt to bridge the soft zones. These materials should be placed in loose lifts of no more than 10 inches and tracked in with a loaded rubber tire truck or beat in with a backhoe bucket. Once the areas are stabilized onsite soils then be placed to the recommended low volume change material subgrade elevation for pavements. If for some reason areas do not stabilize with 1 to 2 lifts of stone, a layer of grid or fabric may need to be incorporated into those areas at that time, followed by additional lifts of stone consisting of ¾ inch minus materials (AB-3).
2. A second option would be to place geo grid like Tensar BX1100 and then place new granular fill similar to ¾-inch minus material in compacted lifts. The grid should extend at least 10 feet past the perimeter of the failing areas and should be overlapped according to the manufactures requirements. If the area does not stabilize by the second lift of ¾ inch minus material, an additional layer of grid should then be placed and the process should be repeated until it is stabilized.

PSI recommends a test section be performed to verify the selected remediation method.





Soil Compaction

Since the surface soils at the site predominantly consist of high moisture content clay soils and medium plasticity clays, it may become difficult to achieve the desired compaction of the soils due to high current moisture contents. After stripping activities the surface soils may also not pass a proof roll in their high moisture content state. The soils may need to be scarified and dried to a moisture content that will facilitate compaction in accordance with the structural fill requirements of this report. If scarifying, drying and recompacting of the soils does not stabilize the soils, removing and replacement with new structural fill or treating the soils with class "C" flyash or lime-treatment of the soils clays may need to be performed.

GEOTECHNICAL RECOMMENDATIONS

The following geotechnical related recommendations have been developed on the basis of the subsurface conditions encountered and PSI's understanding of the proposed development. Should changes in the project criteria occur, a review must be made by PSI to determine if modifications to our recommendations will be required.

Site Preparation

PSI recommends that topsoil, vegetation, roots, soft, organic, frozen, or unsuitable soils in the construction areas be stripped from the site and either wasted or stockpiled for later use in non-structural areas. A representative of the geotechnical engineer should evaluate and document the required depth of removal at the time of construction.

Foundations of existing structures should not be undermined during construction. If it is necessary to excavate immediately adjacent to or below existing foundations, the geotechnical engineer should be contacted to review the proposed excavation procedures, prior to their implementation.

After stripping to the proposed subgrade level, as required, the building area and parking area should be proof-rolled with a loaded tandem axle dump truck or similar heavy rubber tired vehicle (typically with an axial load greater than nine (9) tons) Soils that are observed to rut or deflect excessively (typically greater than one (1) inch) under the moving load should be undercut and replaced with properly compacted low plasticity fill material. The proof-rolling and undercutting activities should be witnessed by a representative of the geotechnical engineer and should be performed during a period of dry weather. Care should be taken during construction activities not to allow excessive drying or wetting of exposed soils. The subgrade soils should be scarified and compacted to at least 95% of the materials' standard Proctor maximum dry density, in general accordance with ASTM procedures, to a depth of at least twelve (12) inches below the surface.

Medium plasticity clays should be removed where they are present within a depth of two (2) feet beneath proposed slabs or lightly loaded structural features and one (1) foot beneath proposed pavements. This material should be replaced with a low plasticity compacted soil, a dense positively-drained graded crushed stone or class "C" flyash or lime-treatment of the medium plastic clays can be performed. Class "C" flyash or lime-treatment of the high plastic clay would reduce the plasticity index, improve workability, promote drying, and reduce shrink/swell potential. A representative of PSI's geotechnical engineer should observe the subgrade soils, perform plasticity index tests, and estimate the approximate extent of the exposed medium plasticity clays. If it is desirable to modify the fat clays with a commercially available class "C" flyash or lime product, PSI recommends that actual application amounts be set by conducting a laboratory class "C" flyash or lime series test. However, for preliminary purposes, the amount of class "C" flyash will likely range from 10 to 15 percent by weight. There are many variables including water and soils chemistry and the variable nature of class "C" flyash.





Therefore, a laboratory test is recommended. The geotechnical engineer’s representative should observe the remediation procedures for compliance with the project plans and specifications.

After subgrade preparation and observation have been completed, fill placement required to establish grade may begin. Low-plasticity structural fill materials placed beneath the lightly loaded structural features or slabs should be free of organic or other deleterious materials and have a maximum particle size of less than three (3) inches. Low-plasticity soils are defined as having a liquid limit less than forty-five (45) and plasticity index less than twenty-five (25). The on-site medium plasticity clay soils may be utilized as fill material to within 1 foot below the final grade for pavements and 2 feet below the final subgrade for lightly loaded structures and building slabs. If medium plasticity clays are utilized as fill, they should have a liquid limit no greater than seventy-five (75) and a plasticity index no greater than forty-five (45). A representative of PSI should be on-site to observe, test, and document the placement of the fill. If the fill is too dry, water should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Close moisture content control will be required to achieve the recommended degree of compaction.

Fill should be placed in maximum loose lifts of eight (8) inches and compacted to at least 95% of the materials’ standard Proctor maximum dry density, and within a range of the optimum moisture content as designated in the table below, as determined in general accordance with ASTM procedures. Each lift of compacted-engineered fill should be tested and documented by a representative of the geotechnical engineer prior to placement of subsequent lifts. The edges of compacted fill should extend a minimum of five (5) feet beyond the building footprint, or a distance equal to the depth of fill beneath the footings, whichever is greater. The measurement should be taken from the outside edge of the footing to the toe of the excavation prior to sloping.

The fill placed should be tested and documented by a geotechnical technician and directed by a geotechnical engineer to evaluate the placement of fill material. It should be noted that the geotechnical engineer of record can only certify the testing that is performed, and the work observed by that engineer or staff in direct report to that engineer. The fill should be evaluated in accordance with the following table:

| MATERIAL TESTED | PROCTOR TYPE | MIN % DRY DENSITY | PLACEMENT MOISTURE CONTENT RANGE | FREQUENCY OF TESTING * ¹ |
|--|--------------|-------------------|----------------------------------|---|
| Structural Lean Clay Fill* (Cohesive) | Standard | 95% | -1 to +3 % | 1 per 2,500 ft ² of fill placed / lift |
| Structural Fat Clay Fill* (Cohesive) | Standard | 95% | 0 to +3% | 1 per 2,500 ft ² of fill placed / lift |
| Structural Fill (Granular)* | Standard | 95% | -2 to +2 % | 1 per 2,500 ft ² of fill placed / lift |
| Random Fill (non load bearing) | Standard | 90% | -3 to +3 % | 1 per 6,000 ft ² of fill placed / lift |
| Utility Trench Backfill | Standard | 95% | -1 to +2 % | 1 per 150 lineal foot / lift |

*Structural Fill is defined as fill beneath or supporting any improvements on site such as foundation, slabs, pavements, etc.

*¹ Minimum 3 per lift.





The test frequency for the laboratory reference should be one laboratory Proctor or Relative Density test for each material used on the site. If the borrow or source of fill material changes, a new reference moisture/density test should be performed.

Tested fill materials that do not achieve either the required dry density or moisture content range shall be recorded, the location noted, and reported to the Contractor and Owner. A re-test of that area should be performed after the Contractor performs remedial measures.

Medium Plasticity Clay Considerations

Due to the presence of medium plasticity clays, consideration should be given to measures that can reduce the long term shrink/swell potential of the clay soils. Medium plasticity clays expand or shrink by absorbing or losing moisture; therefore, reducing the moisture content variation of a soil will reduce its volume change. Although it is not possible to prevent soil moisture changes, a number of steps may be taken to aid in the reduction of subsoil moisture content variations. These steps are intended to help reduce the shrink/swell potential, not eliminate it. Some of these measures are:

1. During construction, a positive drainage scheme should be implemented and maintained to prevent ponding of water on subgrades.
2. The building subgrade should not be allowed to dry out; backfill should proceed as soon as possible to minimize changes in the natural moisture regime.
3. Permanent positive drainage should be maintained around the building through a roof/gutter system connected to drainage piping or discharging upon paved surfaces, thereby transmitting water away from the foundation perimeter. In addition, site grading should provide rapid drainage of surface water away from foundation areas.
4. Utility trenches should be backfilled with low plasticity clays or lean concrete to reduce the potential of the trenches to act as aqueducts transmitting water beneath the structures due to excess surface water infiltration.
5. Shrubbery, flower beds and sprinkler systems surrounding the structures should be eliminated or at least limited, and should be designed so that the bedding soils drain away from the building areas. The planters should have impermeable bases with weep holes discharging into drainage pipes or onto paved surfaces.
6. Trees and/or large bushes should not be planted adjacent to the structures.
7. Since plumbing and other water leaks can cause excessive heaving of high plasticity soils, every effort should be made to maintain the plumbing in good working order and prevent or minimize water leaks and discharges. It is recommended that all water supply lines and waste water lines be tested for leaks prior to backfilling the utility trenches.

Shallow Foundation Recommendations

The planned additions can be supported on conventional spread-type footing foundations bearing on either competent naturally deposited soils or properly compacted and documented fill. If soft unsuitable or fill soils are encountered, they should be removed and replaced with compacted engineered fill. Spread footings for building





columns and continuous footings for bearing walls can be designed for the following allowable soil bearing pressures, respectively, based on calculated settlement for the anticipated dead load plus design live load.

| COLUMN DESIGN LOADS, Q (KIPS) | *ALLOWABLE BEARING PRESSURE FOR COLUMNS FOOTINGS (PSF) |
|-------------------------------|--|
| 100 | 2,500 |
| 150 | 2,000 |
| 250 | 1,700 |

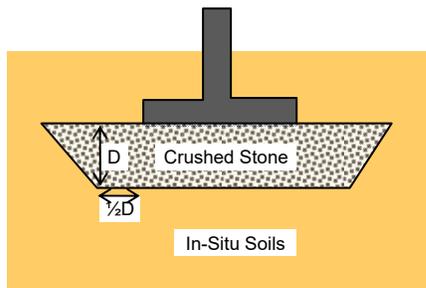
*Based on settlement tolerance of up to 1-inch of total settlement and ¼ inch of differential settlement

| WALL DESIGN LOADS (KIPS) | *ALLOWABLE BEARING PRESSURE CONTINUOUS FOOTINGS (PSF) |
|--------------------------|---|
| 6 | 2,000 |
| 12 | 1,400 |

*Based on settlement tolerance of up to 1-inch of total settlement and ¼ inch of differential settlement

PSI recommends a minimum dimension of twenty-four (24) inches for square footings and eighteen (18) inches for continuous footings to minimize the possibility of a local bearing capacity failure.

If a higher bearing capacity is required, PSI recommends that building footings to bear on 3 feet of new engineered fill consisting of crushed rock placed as recommended below. Spread footings for building columns and continuous footings for bearing walls can be designed for the following allowable bearing pressures.



| COLUMN DESIGN LOADS, Q (KIPS) | *ALLOWABLE BEARING PRESSURE FOR COLUMNS FOOTINGS (PSF) |
|-------------------------------|--|
| 100 | 3,000 |
| 150 | 2,800 |
| 250 | 2,500 |

*Based on 3 feet of improvement beneath footing elevation and also based on settlement tolerance of up to 1-inch of total settlement and ¼ inch of differential settlement





| WALL DESIGN LOADS (KIPS) | *ALLOWABLE BEARING PRESSURE CONTINUOUS FOOTINGS (PSF) |
|-------------------------------------|--|
| 6 | 2,500 |
| 12 | 2,000 |

*Based on 3 feet of improvement beneath footing elevation and also based on settlement tolerance of up to 1-inch of total settlement and ¼ inch of differential settlement

PSI recommend the excavation within footings to extend laterally for at least 8 inches beyond all edges of the footing for each 12 inches of additional excavation required below foundation design elevation. Backfill procedures could be performed with compacted granular fill to the design bearing elevation. For granular fill placement, PSI recommends using well-graded granular material, 1-inch minus, placed in lifts of 8 inches compacted to at least 95 percent of the material's maximum dry density per ASTM D1557.

Ground Improvement

Ground improvement, such as vibro stone columns (VSC) or rammed aggregate piers (RAP), could be used on this site if additional bearing capacity is required or if the footing area needs to be reduced for cost savings. VSC/RAPs are essentially a column of stone that is tightly compacted and the building foundation elements can rest directly on top of the stone column. At this site, PSI would estimate that a system of stone columns installed at a minimum area replacement of 15-20 percent, extended to approximate depths of 15 to 20 feet below the proposed footing could be designed for a bearing capacity between 4,000 psf and 5,000 psf. These calculations are for estimation purposes only and should not be used as a stone column design. It is PSI's experience that these systems are typically designed by the specialty contractor based on their equipment and the sensitivity to the installation method.

Deep Foundations

Due to the low bearing capacity of the upper soil layers, deep foundations are a viable foundation recommendation. This recommendation can be accomplished by using auger cast in place piles, or drilled piers.

Vertical Design Recommendations for Drilled Piers and Auger Cast Piles

As a result of the field explorations, refusal materials and hard shale were encountered from an approximate depth of 15 feet to an approximate depth of 20 feet. These refusal depths are based the equipment used as part of this exploration. Large sections of weathered rock or high quantities of granular material may be encountered between the borings that could cause problems in auger using standard soil excavation techniques. Depending on the size of the excavation machines and augers, refusal may be shallower than those stated in this report and should not be used as an exact depth in pricing of the drilled pier and auger cast pile installation.

Below outlines the parameters for use in the design of the allowable capacity of the drilled piers and auger cast piles on and through the soil. The previously discussed parameters should be used for designing with 2 - foot socket in shale.





| STRATA TYPE | APPROXIMATE DEPTHS (FT) | ALLOWABLE BEARING CAPACITY (PSF) | ALLOWABLE SKIN FRICTION (PSF) |
|------------------------|-------------------------|----------------------------------|-------------------------------|
| Medium Plasticity Clay | 0-9 | --- | 330 |
| High Plasticity Clay | 5-20 | --- | 330 |
| Shale | 15-20* | 8,000 | 1,500 |

*In borings where shale was not encountered in the upper 20 feet, PSI recommends to extend pier to depths deeper than 20 feet and socket piers 2 feet into intact shale.

When uplift is a concern for a deep foundation, then the pier design is typically controlled by the uplift forces applied to the sides of the foundation. Uplift capacity is equal to the allowable skin friction and the weight of the pier. The effective weight of the pier concrete (at 145 pcf) should be included in the uplift calculations. The skin friction within 1 diameter of the base can be included in the capacity calculation for uplift.

Based on the known subsurface conditions and site geology, laboratory testing and past experience, PSI anticipates that properly designed and constructed footings supported on the recommended materials should experience total settlements of less than ½-inch.

Lateral Design Recommendations for Drilled Piers and Auger Cast Piles

The lateral loads on the piers can be calculated with the parameters given in the following table. These parameters are for analytical programs such as L-Pile or COM624P which will analyze both the applied load verse strain resistance of the soil and the deflection of the structural element. In general, the upper 5-feet below grade of the pier is ignored in the lateral capacity for exterior piles and for areas exposed to footings.

The lateral loads on the piles can be calculated with the parameters given in the following table. These parameters are for analytical programs such as L-Pile or COM624P which will analyze both the applied load verse strain resistance of the soil and the deflection of the structural element. In general, the upper 3-feet below grade of the element is ignored in the lateral capacity for exterior piles and for areas exposed to footings. Depending on the elevation that the piles are installed from, PSI recommends the upper 5 feet of material from the time of pile installation be ignored as well due to disturbances during construction.

| Materials | Approximate Depths (feet) | Shear Strength (psf) | K (pci) | Strain, e ₅₀ | Uniaxial Compression (psi) | Initial Modulus (psi) | Model |
|----------------------------------|---------------------------|----------------------|---------|-------------------------|----------------------------|-----------------------|-------|
| Medium Plasticity Clay | 0-9 | 1,500 | 250 | 0.01 | --- | --- | 1 |
| High Plasticity Clay Above Water | 5-17 | 1,500 | 250 | 0.01 | --- | --- | 1 |
| High Plasticity Clay below Water | 10-20 | 1,000 | 200 | 0.02 | --- | --- | 3 |
| Shale | 15-20 | 4,000 | 1,400 | 0.004 | 300 | 500,000 | 4 |

Model 1 – Stiff Clay w/o H₂O
 Model 4 – Reese Weak Rock

Model 2 – Soft Clay
 Model 5 – Strong Rock

Model 3 – Stiff Clay w/ H₂O





Auger Cast Construction Considerations

The structure could be founded on auger cast piles. Load bearing properties of at least one of the auger-cast pile should be evaluated by performing a load test, in general accordance with the, "Standard Method of Testing Piles under Axial Compressive Load," (ASTM D1143) prior to constructing the remaining pile foundations. Procedures required for constructing the test pier should be observed in order to establish desirable procedures for constructing the remaining piles. The test pier concrete should be at least 14 days old at the start of the load test with a 7-day break of a test cylinder of at least 80% of the design strength. Accurate records of the auger-cast pile installations shall be obtained during construction and in accordance with the observation requirements listed in this report. Installation of auger-cast piles shall not be undertaken within 8 diameters of pile elements that are less than 24 hours since concrete placement.

Satisfactory performance of auger-cast in place piles is often dependent upon the skill of the contractor installing the piles. A demonstration pile is recommended for the contractor to demonstrate that the operator and system have the procedures and skills that match the site conditions. Auger-cast-in-place piles are installed by rotating a continuous-flight hollow-stem auger into the subgrade and advancing to a predetermined depth. When the depth is reached, a high strength sand-cement grout is pumped, under controlled pressure, through the center of the shaft as the auger is slowly withdrawn. By maintaining pressure in the grout line and slowly extracting the auger no faster than an equivalent volume of grout is pumped, a continuous column of concrete is formed.

A properly functioning pressure gage and pump stroke counter should be provided on the grout pump to assist in monitoring auger-cast-in-place pile installations. The counter is used to determine the volume of grout pumped by counting the number of strokes of a displacement-type pump. The pump should be calibrated prior to its use and any time grout takes are questionable. The pressure gage is used to monitor the pressure of the grout to evaluate the rate at which the auger should be retracted and if the auger or hoses are plugged. The auger should be withdrawn with slow positive rotation at a slow steady pull and should not be pulled until the grout has been pumped several feet above the downhole tip. Hydraulic controls should be required on the crane supporting the auger so that the auger can be withdrawn in a slow, smooth, continuous motion.

If improper procedures are used during installation of auger-cast-in-place piles, the installation can cause ground loss in the immediate vicinity of the pile due to overmining, with resulting local surface subsidence. In some soil conditions, the pressure of the grout can cause vertical movement or heave of adjacent soil and structures. The static load of the grout plus the added installation pressure may cause local "failure" of the soil, resulting in high grout-takes. Conversely, if not enough head is maintained, the soil could squeeze, resulting in necked piles.

Based on the parameters above, PSI has also provided allowable load capacities for 3 pile diameters for auger cast piles as shown in the following tables. The load capacities were based on a factor of safety of 2 for allowable skin friction and factor of safety 3 for end bearing. The following allowable load capacities can be expected for the given pile diameters based on the provided parameters above:





Estimated Load Capacities for Different Size Auger Cast Piles Bearing on Shale

| End Bearing Material | Estimated Pile Length (feet) | Pile Diameter, D (inches) | *Estimated Allowable Load Capacity (kips) |
|----------------------|------------------------------|---------------------------|---|
| Shale | 20 | 16 | 35 |
| | | 18 | 40 |
| | | 20 | 50 |
| | | 24 | 60 |

*Note that these capacities are for the allowable load capacity of the soil

Drilled Pier Construction Considerations

To facilitate pier construction, concrete should be on site and ready for placement as the pier excavation is completed. The foundation excavation should be cleaned of loose or disturbed materials and any free water before placing reinforcing steel and concrete.

Loose materials on the bearing surface must be removed prior to concrete placement. To reduce the lateral movement of the pier, the contractor must place the pier concrete in intimate contact with undisturbed natural soil. The contractor must fill voids or enlargements in the pier shaft excavation with concrete at the time of concrete placement.

Concrete slumps ranging from 4 to 7 inches are recommended for drilled pier construction. Concrete with slumps in this range will usually fill irregularities along the side and bottom of the hole. Concrete should be placed into the drilled hole through a centering chute at the surface to prevent contact with the sides of the hole and reinforcing steel. This procedure will reduce the potential side flow and segregation. The sequence of operations should be scheduled so that each pier is drilled, reinforcing steel is placed, and concrete is placed in a continuous, rapid, and orderly manner to reduce the time the excavation is open.

PSI should be retained to provide observation and testing of construction activities involved in the foundation, earthwork, and related activities of this project. PSI cannot accept responsibility for conditions that deviate from those described in this report, nor for the performance of the foundation system if not engaged to also provide construction observation and testing for this project.

Earthquake and Seismic Design Consideration

The 2012 International Building Code (IBC) requires that a site class be determined for the calculation of earthquake design forces in structures. The site class designation is a function of soil type (i.e., depth of soil and strata types). Based on PSI's borings and experience in this area, Site Class "D" is recommended. The USGS-NEHRP probabilistic ground motion values interpolated between the nearest four grid points from latitude 39.2846° and longitude -94.9328° are as follows:





| Period (seconds) | 2% Probability of Event in 50 years (%g) | Site Coefficients | Max. Spectral Acceleration parameters | Design Spectral Acceleration parameters | |
|-----------------------|--|----------------------|--|--|--|
| 0.2 (S _s) | 11.0 | F _a = 1.6 | S _{ms} = 0.176 | S _{Ds} = 0.117 | T ₀ = 0.16 |
| 1.0 (S ₁) | 6.0 | F _v = 2.4 | S _{m1} = 0.144 | S _{D1} = 0.096 | T _s = 0.82 |
| | | | S _{ms} = F _a S _s S _{m1} = F _v S ₁ | S _{Ds} = 2/3 * S _{ms} S _{D1} = 2/3 * S _{m1} | T ₀ = 0.2 * S _{D1} /S _{Ds} T _s = S _{D1} /S _{Ds} |

The Site Coefficients, F_a and F_v were interpolated for IBC 2012 Tables 1613.3.3(1) and 1613.3.3(2) as a function of the site classifications and the mapped spectral response acceleration at the short (S_s) and 1-second (S₁) periods.

Based on the Spectral Acceleration values for this site, structures with a Risk Category of I, II, and III (Table 1604.5) should be designed as a Seismic Design Category B as defined in Tables 1613.3.5(1) and 1613.3.5(2).

Floor Slab Recommendations

The floor slab can be grade supported on naturally occurring on a minimum of twenty-four (24) inches of properly compacted low plasticity structural fill. Alternatively, class “C” flyash or lime-treatment of the medium plastic clay can be accomplished to reduce the plasticity index, improve workability, promote drying, and reduce shrink/swell potential. Proof-rolling, as discussed earlier in this report, should be accomplished to identify soft or unstable soils that should be removed from the floor slab area prior to fill placement and/or floor slab construction. These soils should be replaced with properly compacted structural fill as described earlier in this report. Fat clays and undocumented fill materials below floor slabs should be remediated, as discussed earlier.

PSI recommends that a minimum four (4) inch thick free-draining granular mat be placed beneath the floor slab to enhance drainage. This 4 inch mat can be included in the 24 inches of remediation recommended in the areas of undocumented fill and medium plasticity clay. The soil surface shall be graded to drain away from the building without low spots that can trap water prior to placing the granular drainage layer. Polyethylene sheeting should be placed to act as a vapor retarder where the floor will be in contact with moisture sensitive equipment or products such as tile, wood, carpet, etc., as directed by the design professional. The decision to locate the vapor retarder in direct contact with the slab or beneath the layer of granular fill should be made by the design professional after considering the moisture sensitivity of subsequent floor finishes, anticipated project conditions, and the potential effects of slab curling and cracking. The floor slabs should have an adequate number of joints to reduce cracking resulting from differential movement and shrinkage.

For subgrade prepared as recommended and properly compacted fill, a modulus of subgrade reaction, k value, of 140 pounds per cubic inch (pci) may be used in the grade slab design based on correlation to values typically resulting from a 1 ft. x 1 ft. plate load test. However, depending on how the slab load is applied, the value will have to be geometrically modified. Where slab loading is distributed over more than a 1 foot by 1 foot area, the value k should be adjusted for larger areas using the following expression for cohesive and cohesionless soil:

Modulus of Subgrade Reaction, $k_s = \left(\frac{k}{B}\right)$ for cohesive soil and

$$k_s = k \left(\frac{B+1}{2B}\right)^2 \text{ for cohesionless soil}$$

Where: k_s = coefficient of vertical subgrade reaction for loaded area,
 k = coefficient of vertical subgrade reaction for 1 square foot area, and





B = effective width of area loaded, in feet

The precautions listed below should be followed for construction of slab-on-grade pads. These details will not reduce the amount of movement, but are intended to reduce potential damage should some settlement of the supporting subgrade take place. Some increase in moisture content is inevitable as a result of development and associated landscaping. However, extreme moisture content increases can be largely controlled by proper and responsible site drainage, building maintenance and irrigation practices.

- Cracking of slab-on-grade concrete is normal and should be expected. Cracking can occur not only as a result of heaving or compression of the supporting soil and/or bedrock material, but also as a result of concrete curing stresses. The occurrence of concrete shrinkage crack, and problems associated with concrete curing may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement, finishing, and curing, and by the placement of crack control joints at frequent intervals, particularly where re-entrant slab corners occur. The American Concrete Institute (ACI) recommends a maximum panel size (in feet) equal to approximately three times the thickness of the slab (in inches) in both directions. For example, joints are recommended at a maximum spacing of twelve (12) feet based on having a four-inch slab. PSI also recommends that the slab be independent of the foundation walls. Using fiber reinforcement in the concrete can also control shrinkage cracking.
- Areas supporting slabs should be properly moisture conditioned and compacted. Backfill in all interior and exterior water and sewer line trenches should be carefully compacted to reduce the shear stress in the concrete extending over these areas.

Exterior slabs should be isolated from the building. These slabs should be reinforced to function as independent units. Movement of these slabs should not be transmitted to the building foundation or superstructure.

Under Slab Drain Recommendations

PSI recommends 24 inches of granular materials be placed below the floor slab. The increased stone layer will further reduce the shrink/swell potential by providing increased drainage beneath the floor slab, which should reduce the potential for rapid moisture content changes from occurring to the subgrade soils beneath the building. PSI highly recommends that slab subgrade be sloped in a manner to drain water from under the slab towards the perimeter drains around the foundation. This grading should be accomplished prior to placing the base aggregate. The perimeter drain can be designed and installed to daylight into the ditch located just south of the proposed building.

Additional underdrains beneath the slab within the granular fill material can also be installed at 100 feet spacing to also help increase drainage and reduce potential water ponding beneath the slab. The slab underdrains will have to connect to a collection pipe that will take the water to the foundation drain or an appropriate exit point. The additional under slab drains are not necessary, however, it will reduce potential water ponding if subgrade was not sloped to drain.

Utilities Trenching

Excavation for utility trenches shall be performed in accordance with OSHA regulations as stated in 29 CFR Part 1926. It should be noted that utility trench excavations have the potential to degrade the properties of the adjacent fill materials. Utility trench walls that are allowed to move laterally can lead to reduced bearing capacity and increased settlement of adjacent structural elements and overlying slabs.





Backfill for utility trenches is as important as the original subgrade preparation or structural fill placed to support either a foundation or slab. Therefore, it is imperative that the backfill for utility trenches be placed to meet the project specifications for the structural fill of this project. PSI recommends that flowable fill or lean mix concrete be utilized for utility trench backfill. If on-site soils are placed as trench backfill, the backfill for the utility trenches should be placed in four (4) to six (6) inch loose lifts and compacted to a minimum of 95% of the maximum dry density achieved by the standard Proctor test. The backfill soil should be moisture conditioned to be within 2% of the optimum moisture content as determined by the standard Proctor test. Up to four (4) inches of bedding material placed directly under the pipes or conduits placed in the utility trench can be compacted to the 90% compaction criteria with respect to the standard Proctor. Compaction testing should be performed for every 200 cubic yards of backfill place or each lift within 200 linear feet of trench, which ever is less. Backfill of utility trenches should not be performed with water standing in the trench. If granular material is used for the backfill of the utility trench, the granular material should have a gradation that will filter protect the backfill material from the adjacent soils. If this gradation is not available, a geosynthetic non-woven filter fabric should be used to reduce the potential for the migration of fines into the backfill material. Granular backfill material shall be compacted to meet the above compaction criteria. The clean granular backfill material should be compacted to achieve a relative density greater than 75% or as specified by the geotechnical engineer for the specific material used.

Below-Grade Walls

Below-grade walls should be designed to resist lateral earth pressures. Lateral earth pressure is developed from the soils present within a wedge formed by the vertical below-grade wall and an imaginary line extending up and away from the bottom of the wall at an approximate 45° angle. The lateral earth pressures are determined by multiplying the vertical applied pressure by the appropriate lateral earth pressure coefficient K. If the walls are rigidly attached to the structure and not free to rotate or deflect at the top, PSI recommends designing the walls for the “at-rest” lateral earth pressure condition using K_0 . Walls that are permitted to rotate and deflect at the top can be designed for the active lateral earth pressure condition using K_a . It is recommended that passive pressure be determined using K_p , with a factor of safety of 2.0 to limit movement. Recommended parameters for use in below grade walls are as follows:

| Recommended Parameters for use in Wall Design | | | | |
|--|------------------------------------|------------------|---------------------|---------------------|
| Material Type | Drained Friction Angle (ϕ') | | | |
| High plasticity Clay (in-situ) | 20° | | | |
| Lean Clay (conditioned and compacted) | 28° | | | |
| High plasticity Clay (conditioned and compacted) | 22° | | | |
| Granular Soils (clean crushed limestone) | 35° | | | |
| Shale | 42° | | | |
| Total Soil Density (pcf) | 125 | | | |
| Total Bedrock Density (pcf) | 145 | | | |
| Cohesion for Clay Soils (psf) (undrained, $\phi = 0$) | 900 | | | |
| Maximum Toe Pressure on Firm Soil (psf) | 2,000 | | | |
| Maximum Toe Pressure on Intact Shale (psf) | 8,000 | | | |
| Groundwater Elevation | At bottom of the wall | | | |
| Parameters specific to soil type | Fat Clay | Lean Clay | Crushed L.S. | L.S. Bedrock |





| | | | | |
|--|------|------|--------|------|
| Friction Factor for Base | 0.27 | 0.35 | 0.47 * | 0.7 |
| Coefficient of Active Pressure (K_a) ** | 0.45 | 0.36 | 0.27 * | 0.20 |
| Coefficient of Passive Pressure (K_p) ** | 2.2 | 2.77 | 3.7 * | 5.0 |
| Coefficient of At-Rest Pressure (K_o) ** | 0.63 | 0.53 | 0.43 * | 0.33 |

* These values may be used for design only if the crushed limestone backfill extends back from the wall certain distances. These are a horizontal distance approximately equal to or greater than the total height of the wall at the surface, and at least one-foot beyond the heel of the wall footing.

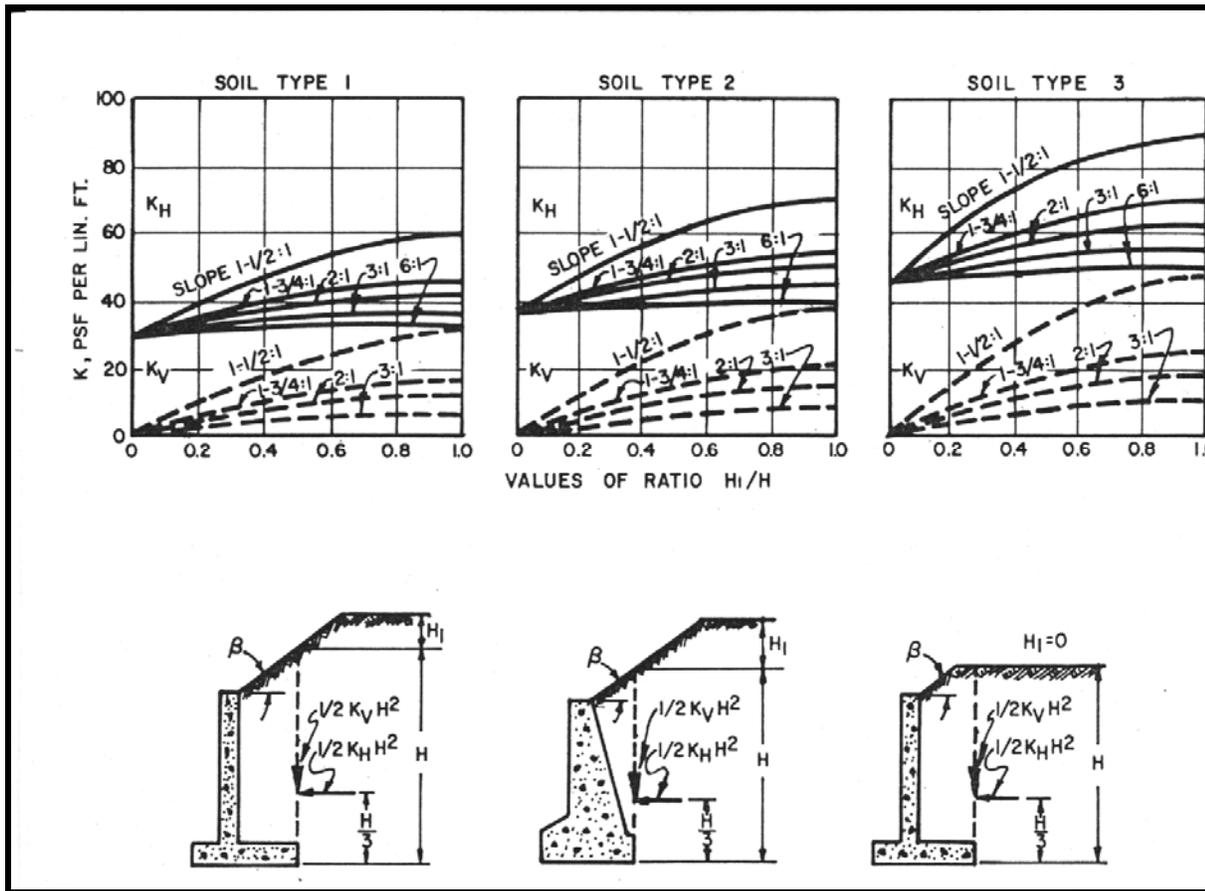
** Earth pressure coefficients valid for level backfill conditions with no surcharge

The values presented above were calculated based on positive foundation drainage is provided to prevent the buildup of hydrostatic pressure. If surface loads are placed near the walls, such as traffic loads, they should be designed to resist an additional uniform lateral load of one-half of the vertical surface loads. An “equivalent fluid” pressure can be obtained from the above chart by multiplying the appropriate K-factor times the total unit weight of the soil. This applies to unsaturated conditions only. If a saturated “equivalent fluid” pressure is needed, the effective unit weight (total unit weight minus unit weight of water) should be multiplied times the appropriate K-factor and the unit weight of water added to that resultant. However, PSI does not recommend that earth retaining walls be designed with a hydrostatic load and that drainage should be provided to relieve the pressure.

In specific design cases where water is allowed to build up on the below-grade wall structure, the hydrostatic load correlating to the maximum height of the water build up should be added to the lateral loads acting on the wall.

The designs of below grade walls need to take into account the effects of geometry and loading conditions. The following charts have been included from NAVFAC 7.02 concerning slopes in the grade at the top of below grade wall. Depending on the geometry of the site, the lateral loading on the below grade wall should be modified according to these charts.





Soil Type 1 – Clean Sand and Gravel, GW, GP, SW, SP

Soil Type 2 – Dirty Sand and Gravel of Restricted Permeability, GM, GM-GP, SM-SP, SM

Soil Type 3 – Stiff Residual Silts and Clays, Silty Fine Sands, Clayey Sands and Gravels: CL, ML, CH, MH, SM, SC, GC

Below-Grade Wall Back-Drain

PSI recommends that the retaining wall be adequately water-proofed and be provided with a wall back-drain system. One possible drainage system is shown in the sketch below and would include:

- 1) A four (4) or six (6) inch diameter perforated drain tile at the bottom of the backfill to collect seepage water with the tile connected to a suitable means of disposal.
- 2) Clean ½ inch or one (1) inch gravel classified as "GP" and containing less than 5% passing a #200 sieve surrounding the draitile.
- 3) Non-woven four (4) ounce per square yard geotextile between the drainage material and the on-site soils to prevent infiltration of fine grained soils into the draitile, granular drainage blanket, or granular backfill.

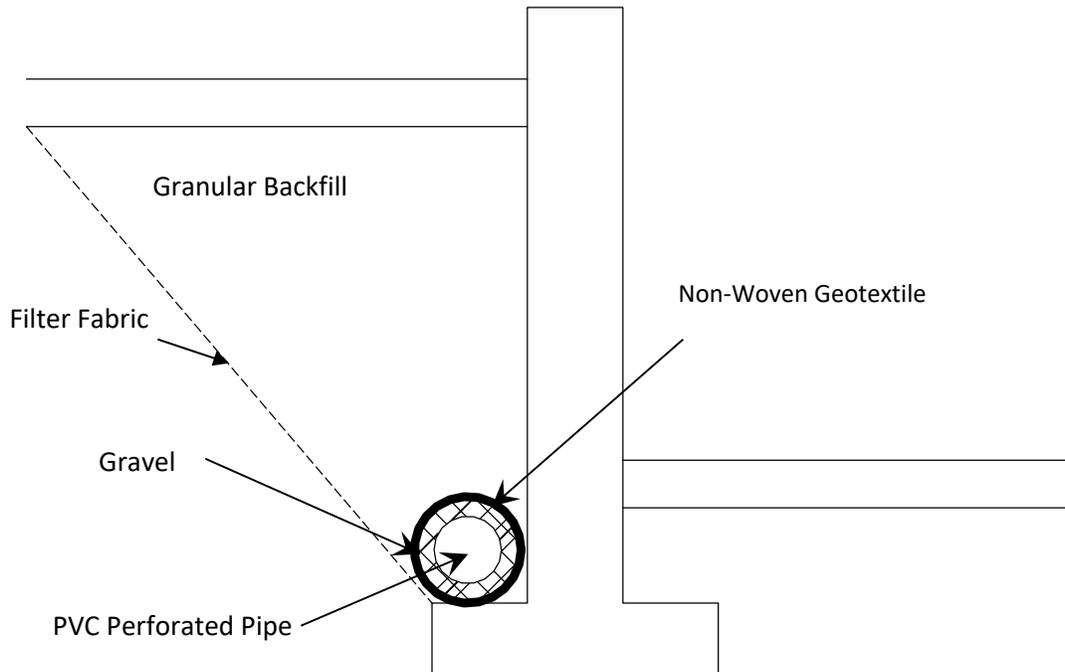
As an alternative, a geocomposite drain material can be placed between the retaining wall and the backfill soils. Underdrains, sub-drains and underslab drains presented in this report will not prevent moisture vapor that can cause mold growth.

The placement of a limited amount of granular material behind a below-grade wall does not appreciably change the coefficient of lateral earth pressure acting on that wall. The lateral earth pressure acting on a below-grade structure is a function of the weight of the soil that exists above the theoretical plane projecting





up from the base of the wall. The soil above this plane is held in place by two forces, the strength of the soil itself and the lateral resistance of the below-grade wall. Therefore, a thin layer of granular material behind the wall is of little consequence on the forces acting on the wall.



Below-Grade Wall Backfill and Compaction

Backfill of the proposed below-grade walls may consist of low plastic soils or granular material. PSI suggests using granular material to provide improved drainage and to reduce lateral pressures on the walls resulting from water pressure. The backfill materials should be placed in lifts that do not exceed 8-inches loose. The lift thickness may need to be reduced to thinner lifts immediately behind the walls to achieve the desired amount of compaction without overstressing the wall with the compaction process.

Backfill should be placed in thin lifts and mechanically compacted to at least 95% of the materials' maximum dry density and within 2% of the optimum water content as determined by the [*standard or modified*] Proctor test. PSI advises performing field density tests on the backfill to monitor compliance with the recommendations provided. Care should be exercised during the backfilling operation to prevent overstressing and damaging the walls.

Pavement Recommendations

PSI's scope of services did not include extensive sampling and CBR testing of existing subgrade or potential sources of imported fill for the specific purpose of detailed pavement analysis. Instead, this report is based on pavement-related design parameters that are considered to be typical for the area soils types.

Pavement sections can be grade supported on a minimum of twelve (12) inches of properly compacted low plasticity structural fill. Class "C" flyash or lime-treatment of the onsite high plastic clays can also be performed. The crushed stone base can be included in the 12 inches of remediation recommended in the areas of undocumented fill and fat clay. Proof-rolling, as discussed earlier in this report, should be accomplished





to identify soft or unstable soils that should be removed from the pavement area prior to fill placement and/or pavement construction. These soils should be replaced with properly compacted structural fill as described earlier in this report.

Pavement sections were evaluated using Pavement Assessment Software (PAS), which is based on the 1993 AASHTO Design equations, a reliability of 80%, an annual growth rate of 2%, and a 20 year equivalent 18-kip single axle load (ESAL) of 30,000 for light duty pavements and 500,000 for heavy duty pavements. Flexible Pavements were evaluated based on an initial serviceability of 4.2 and a terminal service of 2.0. Rigid Pavements were evaluated based on an initial serviceability of 4.5, a terminal service of 2.0, an unreinforced concrete mix with a 28-day modulus of rupture of 650 pounds per square inch (psi) (approximately 4,000 psi compressive strength), are to be edge supported, and dowel and mesh reinforced.

In large areas of pavement, or where pavements are subject to significant traffic, a more detailed analysis of the subgrade and traffic conditions should be made. The results of such a study will provide information necessary to design an economical and serviceable pavement.

The recommended thicknesses presented below are considered typical and minimum for the calculated parameters. The client, the owner, and the project principals should be aware that thinner pavement sections might result in increased maintenance costs and lower than anticipated pavement life. The pavement subgrade should be prepared as discussed below.

The PSI recommendation is based on the subgrade soils being prepared to achieve a minimum CBR of three (3). On this basis, it is possible to use a locally typical "standard" pavement section consisting of the following:





| RECOMMENDED THICKNESSES (INCHES) | | |
|---|----------------------|-----------------------|
| PAVEMENT MATERIALS * | CAR PARKING | DRIVEWAYS |
| | 30,000 ESAL'S | 500,000 ESAL'S |
| Asphaltic Surface Course | 1½ | 1½ |
| Asphaltic Binder Course | 2 | 5½ |
| Crushed stone (3/4-inch minus) | 6 | 6 |
| Or | | |
| Portland Cement Concrete | 5 | 6 |
| Crushed stone (3/4-inch minus) | 4 | 6 |

*Pavement materials should conform to local and state guidelines, if applicable.

Asphalt Pavement

The granular base course should be built at least two (2) feet wider than the pavement on each side to support the tracks of the slipform paver. This extra width is structurally beneficial for wheel loads applied at the pavement edge. The asphalt base course should be compacted to a minimum of 95% Marshall density according to ASTM D1559.

Asphaltic surface mixture should have a minimum stability of 1,800 pounds and the surface course should be compacted to a minimum of 97% Marshall density according to ASTM D1559. Asphalt mixes should comply with APWA or KDOT specifications.

Asphaltic concrete mix designs and Marshall characteristics should be reviewed to determine if they are consistent with the recommendations given in this report.

Portland Cement Concrete Pavement

Because the pavement at this site will be subjected to freeze-thaw cycles, PSI recommends that an air entrainment admixture be added to the concrete mix to achieve air content in the range of 5% to 7% to provide freeze-thaw durability in the concrete. PSI recommends that a portland cement concrete with a 28-day specified compressive strength of 4,000 psi should be used. A mixture with a maximum slump of four (4) inches is acceptable. If a water reducing admixture is specified, the slump can be higher. It is recommended that admixtures be submitted to the owner in advance of use in the concrete.

Pavement for any dumpster areas or areas subject to consistent heavy loads should be constructed of Portland cement concrete with load transfer devices installed where construction joints are required. A thickened edge is recommended on the outside of slabs subjected to wheel loads. This thickened edge usually takes the form of an integral curb. Fill material should be compacted behind the curb or the edge of the outside slabs should be thickened. The following are recommended to enhance the quality of the pavement.

- Moisten subgrade just prior to placement of concrete.
- Cure fresh concrete with a liquid membrane-forming curing compound.





- Keep automobile traffic off the slab for three (3) days and truck traffic off the slab for seven (7) days, unless tests are made to determine that the concrete has gained adequate strength (i.e., usually 70% of design strength).

Pavement Subgrade Preparation

Prior to paving, the prepared subgrade should be proof-rolled using a loaded tandem axle dump truck or similar type of pneumatic tired equipment with a minimum gross weight of nine (9) tons per single axle. Localized soft areas identified should be repaired prior to paving. Moisture content of the subgrade should be maintained between -2% and +3% of the optimum at the time of paving. It may require rework when the subgrade is either desiccated or wet. PSI highly recommends that parking and drive subgrade be sloped in a manner to drain water from under the pavement without pocketing or trapping water beneath the pavement. This grading should be accomplished prior to placing the base aggregate.

Construction traffic should be minimized to prevent unnecessary disturbance of the pavement subgrade. Disturbed areas, as verified by PSI, should be removed and replaced with properly compacted material.

The edges of compacted fill should extend a minimum two (2) feet beyond the edges of the pavement, or a distance equal to the depth of fill beneath the pavement, whichever is greater. The measurement should be taken from the outside edge of the pavement to the toe of the excavation prior to sloping.

Pavement Drainage & Maintenance

PSI recommends pavements be sloped to provide rapid surface drainage. Water allowed to pond on or adjacent to the pavement could saturate the subgrade, cause premature deterioration of the pavements, and may require removal and replacement. PSI recommends the subgrade be sloped to drain prior to placing the crushed stone base. Consideration should be given to the use of interceptor drains to collect and remove water collecting in the crushed stone base. The interceptor drains could be incorporated with the storm drains of other utilities located in the pavement areas.

Periodic maintenance of the pavement should be anticipated. This should include sealing of cracks and joints and by maintaining proper surface drainage to avoid ponding of water on or near the pavement areas. Underdrains, sub-drains and underslab drains presented in this report will not prevent moisture vapor that can cause mold growth.

CONSTRUCTION CONSIDERATIONS

PSI should be retained to provide observation and testing of construction activities involved in the foundation, earthwork, and related activities of this project. PSI cannot accept responsibility for conditions that deviate from those described in this report, nor for the performance of the foundation system if not engaged to also provide construction observation and testing for this project.

Moisture Sensitive Soils/Weather Related Concerns

The upper fine-grained soils encountered at this site are expected to be sensitive to disturbances caused by construction traffic and to changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction





activities. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather.

Drainage and Groundwater Considerations

PSI recommends that the Contractor determine the actual groundwater levels at the site at the time of the construction activities to assess the impact groundwater may have on construction. Water should not be allowed to collect in the foundation excavation, on floor slab areas, or on prepared subgrades of the construction area either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of collected rainwater, groundwater, or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the floor slabs. The grades should be sloped away from the building and surface drainage should be collected and discharged such that water is not permitted to infiltrate the backfill and floor slab areas of the building.

Excavations

In Federal Register, Volume 54, Number 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better enhance the safety of workers entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavation or footing excavations, be constructed in accordance with the new OSHA guidelines. It is PSI's understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

PSI is providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations.

GEOTECHNICAL RISK

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed construction will perform as planned. The engineering recommendations presented in the preceding section constitutes PSI's professional estimate of those measures that are necessary for the proposed improvements to perform according to the proposed design based on the information generated and referenced during this evaluation, and PSI's experience in working with these conditions.





REPORT LIMITATIONS

The recommendations submitted are based on the available subsurface information obtained by PSI and design details furnished by DLR Group. If there are revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the recommendations are required. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the project.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

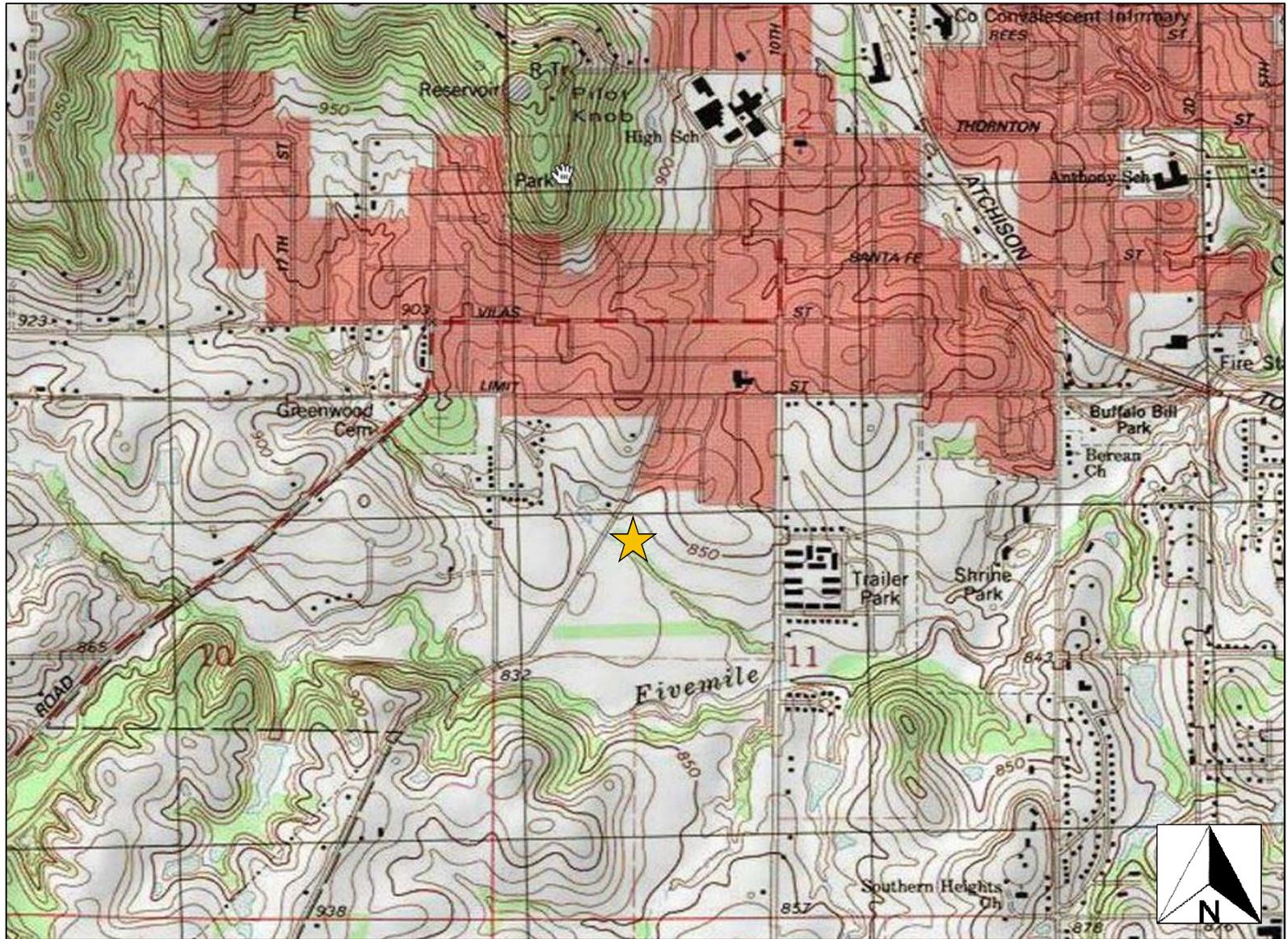
After the plans and specifications are more complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of DLR Group for the specific application to the proposed Richard Warren Middle School located at 3501 New Lawrence Road in Leavenworth, Kansas.





APPENDIX A - TOPOGRAPHIC MAP

Intertek-PSI



Topographic Drawing
Richard W. Warren Middle School
3501 New Lawrence Road
Leavenworth, Kansas 66048

Intertek-PSI Project No.:

338-1778

Year of Topo

--

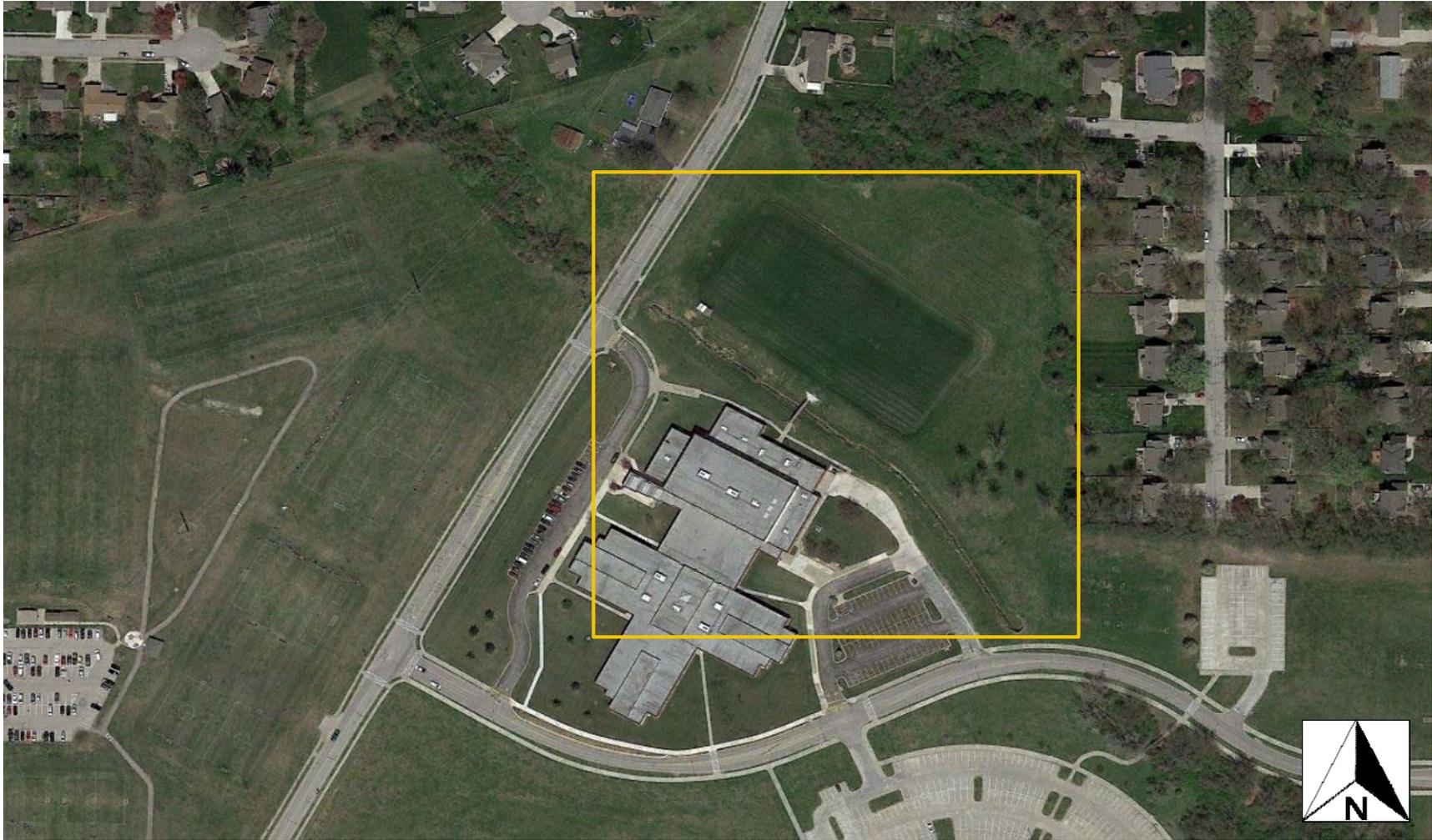
Drawn By:

IMS



APPENDIX B - SITE VICINITY MAP

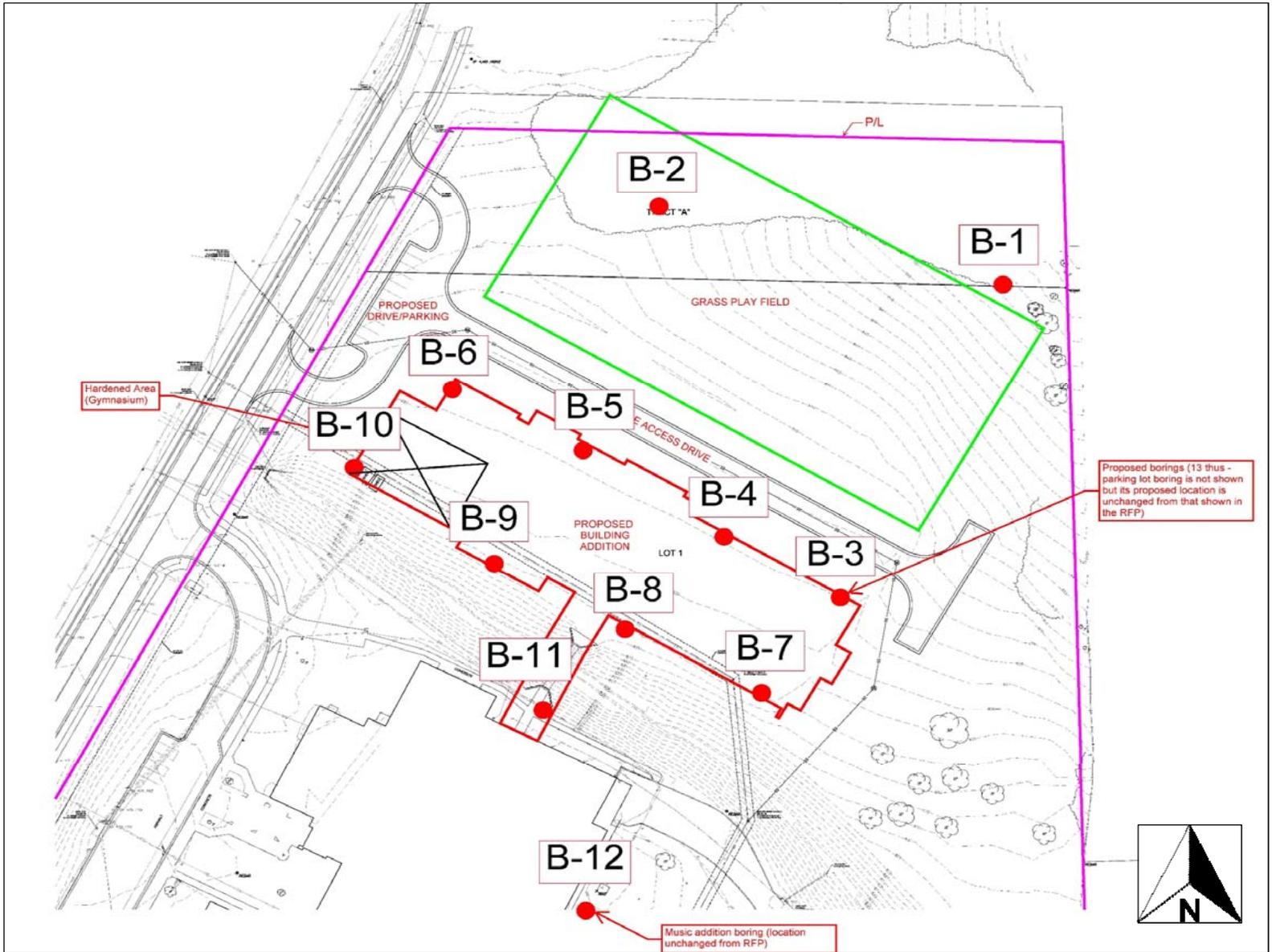
Intertek-PSI



| | | | |
|--|----------------------------------|-----------------|--------------------------------|
| Site Vicinity Plan Richard W. Warren Middle School 3501 New Lawrence Road Leavenworth, Kansas 66048 | Intertek-PSI Project No.: | 338-1778 | |
| | Aerial Year: | 2018 | Drawn By: IMS |
| | Drawing Date: | 8/3/18 | |



APPENDIX C – BORING LOCATION PLAN



Boring Location Diagram
 Richard W. Warren Middle School
 3501 New Lawrence Road
 Leavenworth, Kansas 66048

Intertek-PSI Project No.:

338-1778

Date:
 8/3/2018

Drawn By:
 IMS

Intertek-PSI



| | | |
|--|----------------------------------|-------------------------|
| Boring Location Diagram Richard W. Warren Middle School 3501 New Lawrence Road Leavenworth, Kansas 66048 | Intertek-PSI Project No.: | 338-1778 |
| | Date: 8/3/2018 | Drawn By: IMS |



APPENDIX D – BORING LOGS

DATE STARTED: 7/23/18 **DRILL COMPANY:** PSI, Inc.
DATE COMPLETED: 7/23/18 **DRILLER:** M. McGoldrick **LOGGED BY:** A. Banks
COMPLETION DEPTH: 20.0 ft **DRILL RIG:** CME-55
BENCHMARK: N/A **DRILLING METHOD:** Hollow Stem Auger
ELEVATION: 853 ft **SAMPLING METHOD:** SS
LATITUDE: **HAMMER TYPE:** Automatic
LONGITUDE: **EFFICIENCY:** 75%
STATION: N/A **OFFSET:** N/A **REVIEWED BY:** C. Dieckmann

BORING B-01

Water
 ∇ While Drilling not observed
 ▼ Upon Completion not observed
 ▽ Delay N/A

BORING LOCATION:

| Elevation (feet) | Depth (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION | USCS Classification | SPT Blows per 6-inch (SS) | STANDARD PENETRATION TEST DATA N in blows/ft @ | Moisture, % | Strength, tsf | Additional Remarks |
|------------------|--------------|-------------|-------------|------------|-------------------|---|---------------------|---------------------------|---|-------------|---------------|--------------------|
| 850 | 0 | | | | | ORGANIC LAYER- APPROXIMATELY 2 INCHES | | | | | | |
| 850 | 1 | | | 1 | 9 | MEDIUM PLASTICITY CLAY Medium plasticity clay, brown | CL-CH | 4-5-5 $N_{60}=13$ | | | | LL = 46 PL = 19 |
| 845 | 5 | | | 2 | 15 | HIGH PLASTICITY CLAY - gray to brown High plasticity clay, gray to brown, rust stains | | 5-7-10 $N_{60}=21$ | | | | |
| 845 | 10 | | | 3 | 15 | High plasticity clay, gray, rust stains | | 4-5-6 $N_{60}=14$ | | | | |
| 840 | 15 | | | 4 | 15 | | CH | 3-5-4 $N_{60}=11$ | | | | |
| 835 | 20 | | | 5 | 16 | | | 3-4-9 $N_{60}=16$ | | | | |
| 835 | 20 | | | 6 | 14 | High plasticity clay, light brown, trace pebbles | | 4-9-12 $N_{60}=26$ | | | | |
| | | | | | | Boring terminated at about 20 feet. | | | | | | |



Professional Service Industries, Inc.
 1211 W. Cambridge Circle Drive
 Kansas City, KS 66103
 Telephone: (913) 310-1600

PROJECT NO.: 338-1778
PROJECT: Richard Warren Middle School
LOCATION: 3501 New Lawrence Road
 Leavenworth, KS

DATE STARTED: 7/23/18 **DRILL COMPANY:** PSI, Inc.
DATE COMPLETED: 7/23/18 **DRILLER:** J. Faillace **LOGGED BY:** L. Nelson
COMPLETION DEPTH: 10.0 ft **DRILL RIG:** CME-55
BENCHMARK: N/A **DRILLING METHOD:** Hollow Stem Auger
ELEVATION: 842 ft **SAMPLING METHOD:** SS
LATITUDE: **HAMMER TYPE:** Automatic
LONGITUDE: **EFFICIENCY:** 75%
STATION: N/A **OFFSET:** N/A **REVIEWED BY:** C. Dieckmann

BORING B-02

| | | | |
|--------------|---|-----------------|--------------|
| Water | ▽ | While Drilling | not observed |
| | ▼ | Upon Completion | not observed |
| | ▽ | Delay | N/A |

BORING LOCATION: _____

REMARKS: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633.

| Elevation (feet) | Depth (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION | USCS Classification | SPT Blows per 6-inch (SS) | STANDARD PENETRATION TEST DATA N in blows/ft ⊙ Moisture % PL LL | Additional Remarks |
|------------------|--------------|-------------|-------------|------------|-------------------|--|---------------------|---------------------------|---|--------------------|
| 0 | | 1, 2, 3 | | | | ORGANIC LAYER- APPROXIMATELY 3 INCHES | | | | |
| 840 | | | | 1 | 9 | MEDIUM PLASTICITY CLAY Medium plasticity clay, dark brown Medium plasticity clay, dark gray | CL-CH | 4-5-6 $N_{60}=14$ | 16 | ⊙ × |
| 5 | | | | 2 | 16 | Medium plasticity clay, gray, rust stains | CL-CH | 4-4-5 $N_{60}=11$ | 18 | ⊙ × |
| 835 | | | | 3 | 14 | HIGH PLASTICITY CLAY | CH | 3-3-4 $N_{60}=9$ | 23 | ⊙ × |
| 10 | | | | 4 | 11 | Boring terminated at about 10 feet. | CH | 2-3-4 $N_{60}=9$ | 22 | ⊙ × |



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PROJECT NO.: 338-1778
PROJECT: Richard Warren Middle School
LOCATION: 3501 New Lawrence Road
 Leavenworth, KS

DATE STARTED: 7/23/18 **DRILL COMPANY:** PSI, Inc.
DATE COMPLETED: 7/23/18 **DRILLER:** J. Faillace **LOGGED BY:** L. Nelson
COMPLETION DEPTH: 20.0 ft **DRILL RIG:** CME-55
BENCHMARK: N/A **DRILLING METHOD:** Hollow Stem Auger
ELEVATION: 837 ft **SAMPLING METHOD:** SS/ ST
LATITUDE: **HAMMER TYPE:** Automatic
LONGITUDE: **EFFICIENCY:** 75%
STATION: N/A **OFFSET:** N/A **REVIEWED BY:** C. Dieckmann

BORING B-03

| | | |
|--------------|-------------------|-----------|
| Water | ▽ While Drilling | 16.5 feet |
| | ▼ Upon Completion | 16.5 feet |
| | ▽ 24 hours | 11.5 feet |

BORING LOCATION:

| Elevation (feet) | Depth (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION | USCS Classification | SPT Blows per 6-inch (SS) Push Pressure (ST) | Moisture, % | STANDARD PENETRATION TEST DATA N in blows/ft ⊙ Moisture × PL LL ⊕ | Additional Remarks |
|------------------|--------------|-------------|-------------|------------|-------------------|--|---------------------|---|-------------|--|--------------------|
| 0 | | | | | | ORGANIC LAYER- APPROXIMATELY 4 INCHES | | | | | |
| 835 | 8 | | 1 | 8 | | MEDIUM PLASTICITY CLAY Medium plasticity clay, brown | CL-CH | 4-5-4 N ₆₀ =11 | 11 | ⊙ ⊕ | LL = 41 PL = 20 |
| 5 | 12 | | 2 | 12 | | Medium plasticity clay, dark gray | | 4-4-4 N ₆₀ =10 | 21 | ⊙ × | |
| 830 | 18 | | 3 | 18 | | HIGH PLASTICITY CLAY High plasticity clay, gray, rust stains | | 3-2-4 N ₆₀ =8 | 27 | ⊙ × | |
| 825 | 20 | | 4 | 20 | | | CH | | | | |
| 820 | 15 | | 5 | 15 | | | | 4-4-5 N ₆₀ =11 | 18 | ⊙ × | |
| 820 | 20 | | 6 | 8 | | High plasticity clay, brown, trace limestone gravel Boring terminated at about 20 feet. | | 3-6-13 N ₆₀ =24 | | ⊙ | |



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PROJECT NO.: 338-1778
PROJECT: Richard Warren Middle School
LOCATION: 3501 New Lawrence Road
 Leavenworth, KS

DATE STARTED: 7/23/18 **DRILL COMPANY:** PSI, Inc.
DATE COMPLETED: 7/23/18 **DRILLER:** J. Faillace **LOGGED BY:** L. Nelson
COMPLETION DEPTH: 20.0 ft **DRILL RIG:** CME-55
BENCHMARK: N/A **DRILLING METHOD:** Hollow Stem Auger
ELEVATION: 837 ft **SAMPLING METHOD:** SS
LATITUDE: **HAMMER TYPE:** Automatic
LONGITUDE: **EFFICIENCY:** 75%
STATION: N/A **OFFSET:** N/A **REVIEWED BY:** C. Dieckmann

BORING B-04

| | | |
|--------------|-------------------|-----------|
| Water | ▽ While Drilling | 18.5 feet |
| | ▼ Upon Completion | 18.5 feet |
| | ▽ 24 hours | 11.5 feet |

BORING LOCATION:

REMARKS: N₆₀ denotes the normalization to 60% efficiency as described in ASTM D4633.

| Elevation (feet) | Depth (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STRENGTH, tsf | Additional Remarks |
|------------------|--------------|---|-------------|------------|-------------------|----------------------|---------------------|------------------------------|-------------|---------------|--------------------|
| 0 | 0 | ORGANIC LAYER - APPROXIMATELY 3 INCHES | | | | | | | | | |
| 835 | 6 | MEDIUM PLASTICITY CLAY Medium plasticity clay, brown | | 1 | 6 | | CL-CH | 5-4-3 N ₆₀ =9 | 22 | | |
| 5 | 12 | HIGH PLASTICITY CLAY | | 2 | 12 | | | 4-3-5 N ₆₀ =10 | 22 | | |
| 830 | 14 | | | 3 | 14 | | | 3-3-3 N ₆₀ =8 | 25 | | |
| 10 | 18 | High plasticity clay, gray to brown, rust stains | | 4 | 18 | | | 2-2-3 N ₆₀ =6 | 24 | | |
| 825 | | | | | | | CH | | | | |
| 15 | 12 | | | 5 | 12 | | | 1-2-2 N ₆₀ =5 | 22 | | |
| 820 | | | | | | | | | | | |
| 20 | 18 | High plasticity clay, brown, rust stains, with limestone gravel | | 6 | 18 | | | 2-4-6 N ₆₀ =13 | 20 | | |
| | | Boring terminated at about 20 feet. | | | | | | | | | |



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 Telephone: (913) 310-1600

PROJECT NO.: 338-1778
PROJECT: Richard Warren Middle School
LOCATION: 3501 New Lawrence Road
 Leavenworth, KS

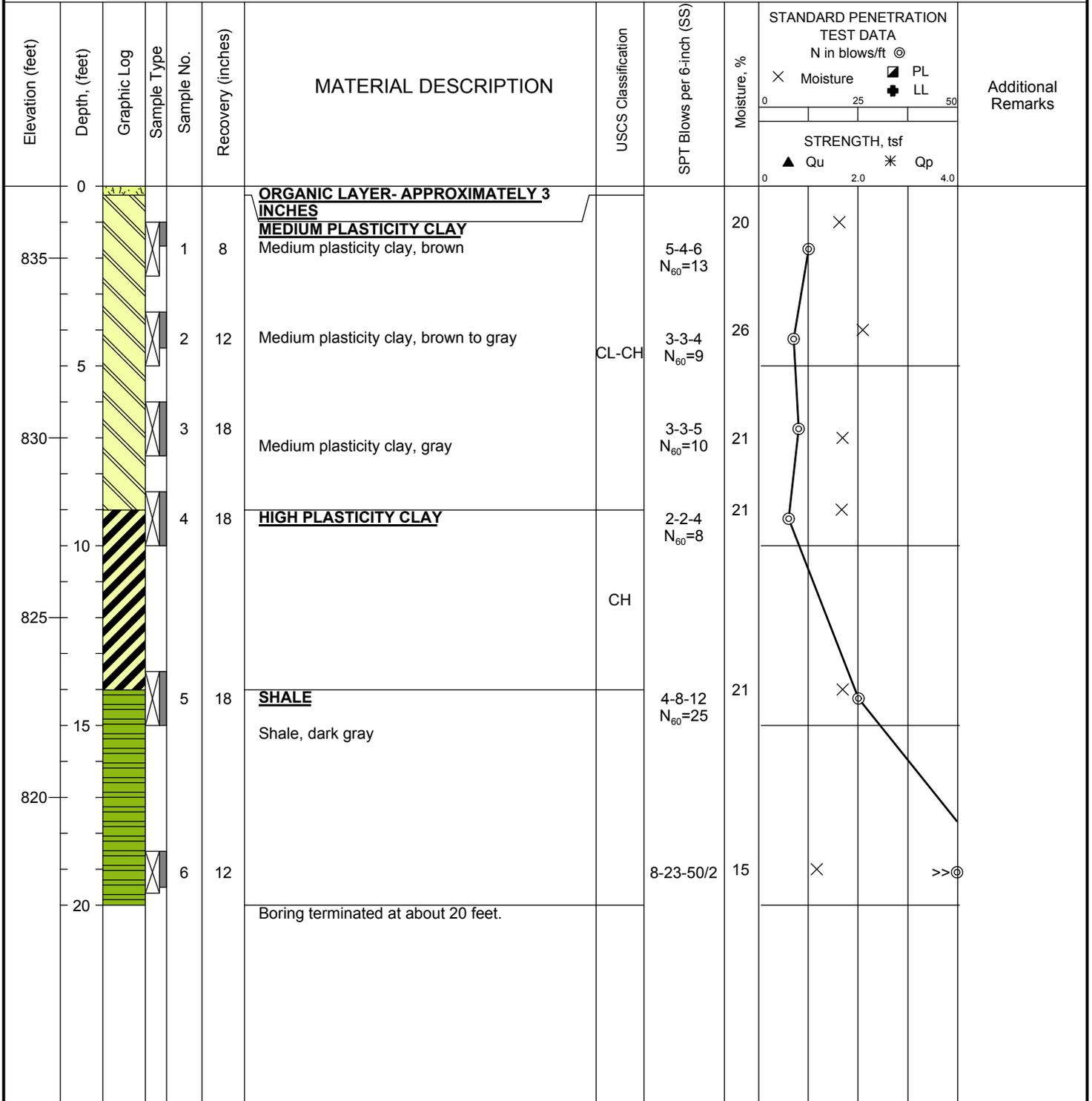
DATE STARTED: 7/23/18 **DRILL COMPANY:** PSI, Inc.
DATE COMPLETED: 7/23/18 **DRILLER:** J. Faillace **LOGGED BY:** L. Nelson
COMPLETION DEPTH: 20.0 ft **DRILL RIG:** CME-55
BENCHMARK: N/A **DRILLING METHOD:** Hollow Stem Auger
ELEVATION: 837 ft **SAMPLING METHOD:** SS
LATITUDE: **HAMMER TYPE:** Automatic
LONGITUDE: **EFFICIENCY:** 75%
STATION: N/A **OFFSET:** N/A **REVIEWED BY:** C. Dieckmann

BORING B-05

Water
 ∇ While Drilling not observed
 ▼ Upon Completion not observed
 ∇ Delay N/A

BORING LOCATION:

REMARKS: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633.



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PROJECT NO.: 338-1778
PROJECT: Richard Warren Middle School
LOCATION: 3501 New Lawrence Road
 Leavenworth, KS

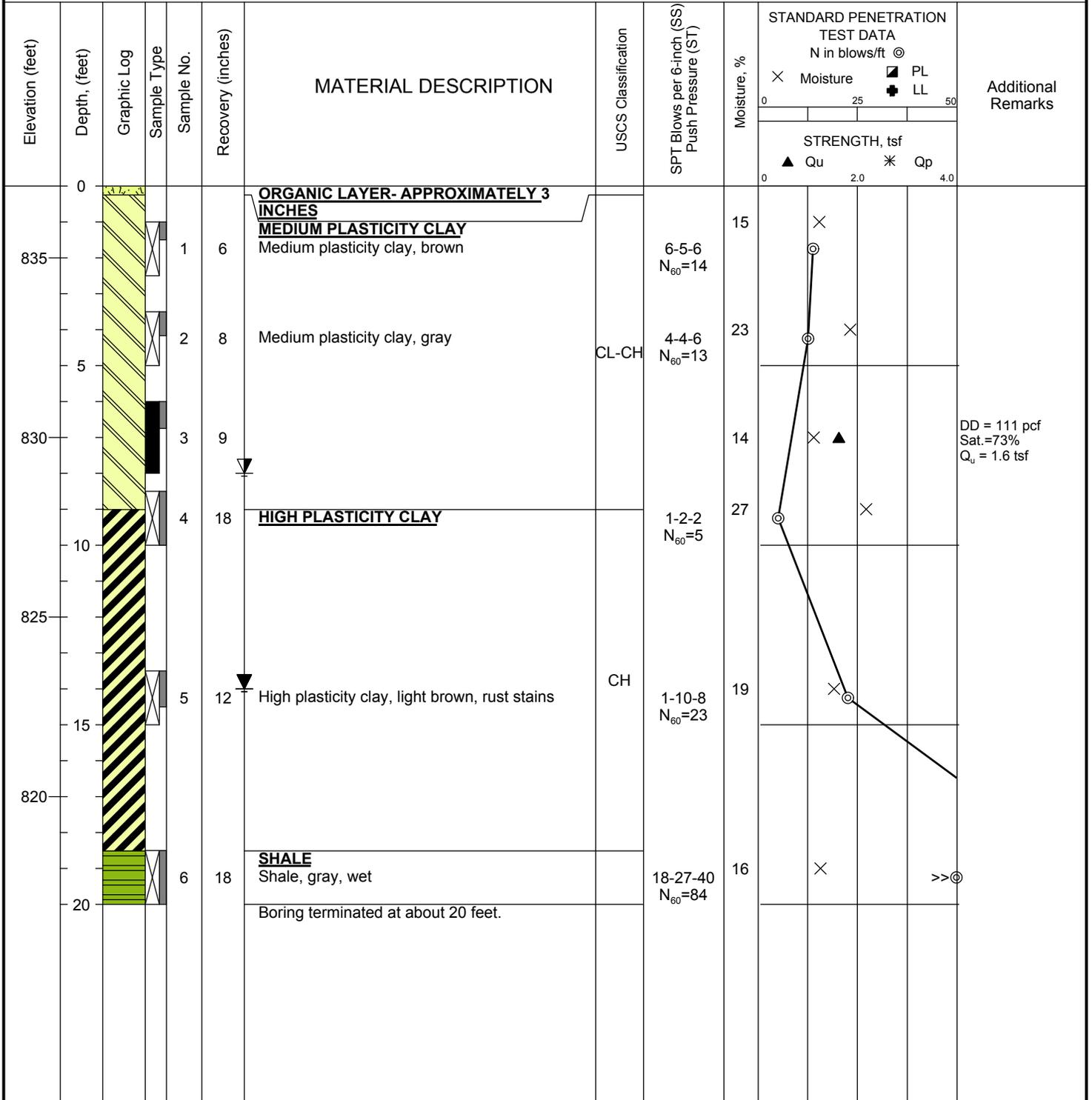
DATE STARTED: 7/23/18 **DRILL COMPANY:** PSI, Inc.
DATE COMPLETED: 7/23/18 **DRILLER:** J. Faillace **LOGGED BY:** L. Nelson
COMPLETION DEPTH: 20.0 ft **DRILL RIG:** CME-55
BENCHMARK: N/A **DRILLING METHOD:** Hollow Stem Auger
ELEVATION: 837 ft **SAMPLING METHOD:** SS/ ST
LATITUDE: **HAMMER TYPE:** Automatic
LONGITUDE: **EFFICIENCY:** 75%
STATION: N/A **OFFSET:** N/A **REVIEWED BY:** C. Dieckmann

BORING B-06

| | | |
|--------------|-------------------|---------|
| Water | ▽ While Drilling | 14 feet |
| | ▼ Upon Completion | 14 feet |
| | ▽ 24 hours | 8 feet |

BORING LOCATION:

REMARKS: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633.



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PROJECT NO.: 338-1778
PROJECT: Richard Warren Middle School
LOCATION: 3501 New Lawrence Road
 Leavenworth, KS

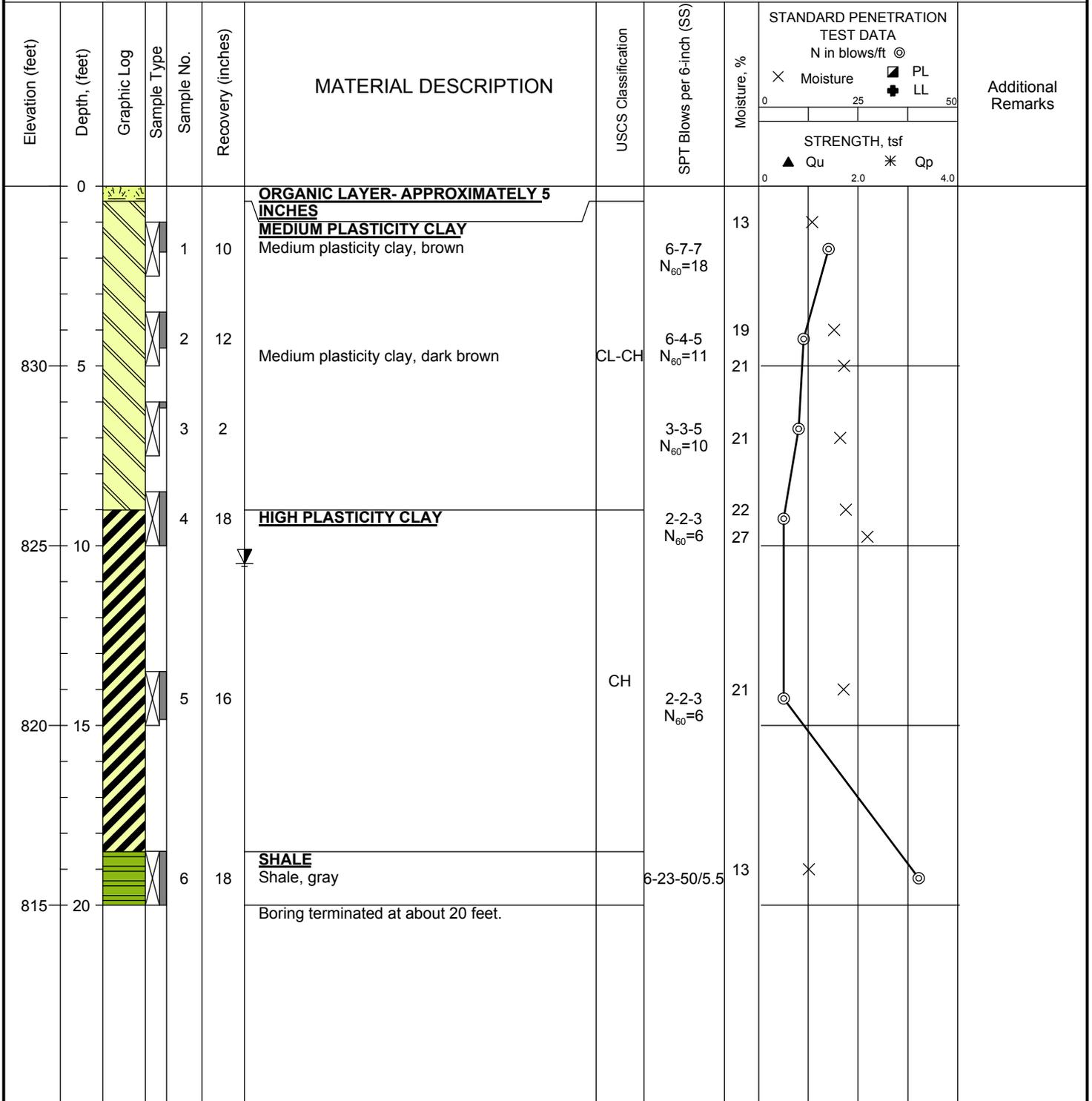
DATE STARTED: 7/23/18 **DRILL COMPANY:** PSI, Inc.
DATE COMPLETED: 7/23/18 **DRILLER:** M. McGoldrick **LOGGED BY:** A. Banks
COMPLETION DEPTH: 20.0 ft **DRILL RIG:** CME-55
BENCHMARK: N/A **DRILLING METHOD:** Hollow Stem Auger
ELEVATION: 835 ft **SAMPLING METHOD:** SS
LATITUDE: **HAMMER TYPE:** Automatic
LONGITUDE: **EFFICIENCY:** 75%
STATION: N/A **OFFSET:** N/A **REVIEWED BY:** C. Dieckmann

BORING B-07

| | | |
|--------------|-------------------|--------------|
| Water | ▽ While Drilling | not observed |
| | ▼ Upon Completion | not observed |
| | ▽ 24 hours | 10.5 |

BORING LOCATION:

REMARKS: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633.



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PROJECT NO.: 338-1778
PROJECT: Richard Warren Middle School
LOCATION: 3501 New Lawrence Road
 Leavenworth, KS

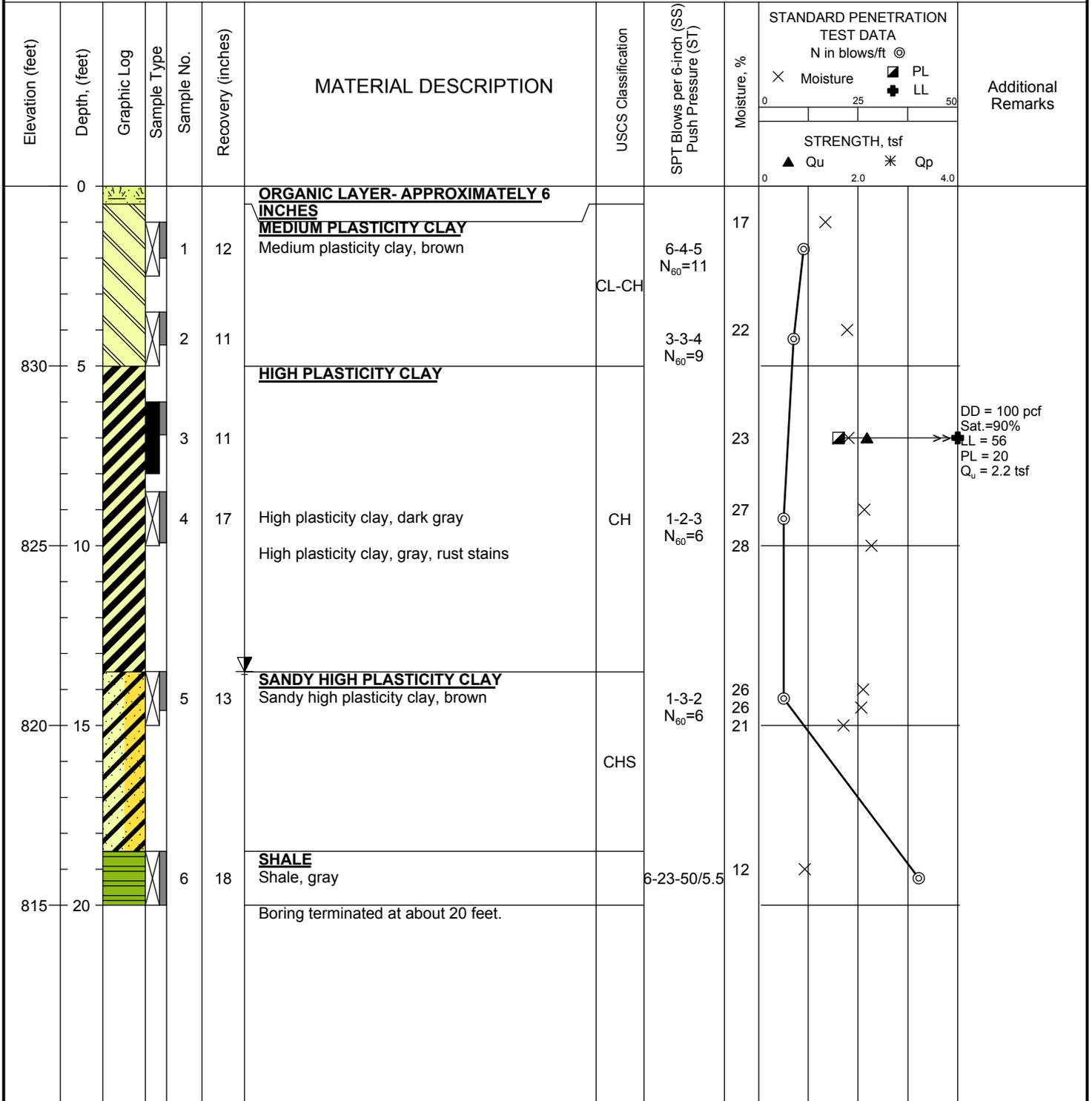
DATE STARTED: 7/23/18 **DRILL COMPANY:** PSI, Inc.
DATE COMPLETED: 7/23/18 **DRILLER:** M. McGoldrick **LOGGED BY:** A. Banks
COMPLETION DEPTH: 20.0 ft **DRILL RIG:** CME-55
BENCHMARK: N/A **DRILLING METHOD:** Hollow Stem Auger
ELEVATION: 835 ft **SAMPLING METHOD:** SS/ ST
LATITUDE: **HAMMER TYPE:** Automatic
LONGITUDE: **EFFICIENCY:** 75%
STATION: N/A **OFFSET:** N/A **REVIEWED BY:** C. Dieckmann

BORING B-08

Water
 ∇ While Drilling not observed
 ▼ Upon Completion not observed
 ∇ 24 hours 13.5

BORING LOCATION:

REMARKS: N₆₀ denotes the normalization to 60% efficiency as described in ASTM D4633.



Professional Service Industries, Inc.
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 Telephone: (913) 310-1600

PROJECT NO.: 338-1778
PROJECT: Richard Warren Middle School
LOCATION: 3501 New Lawrence Road
 Leavenworth, KS

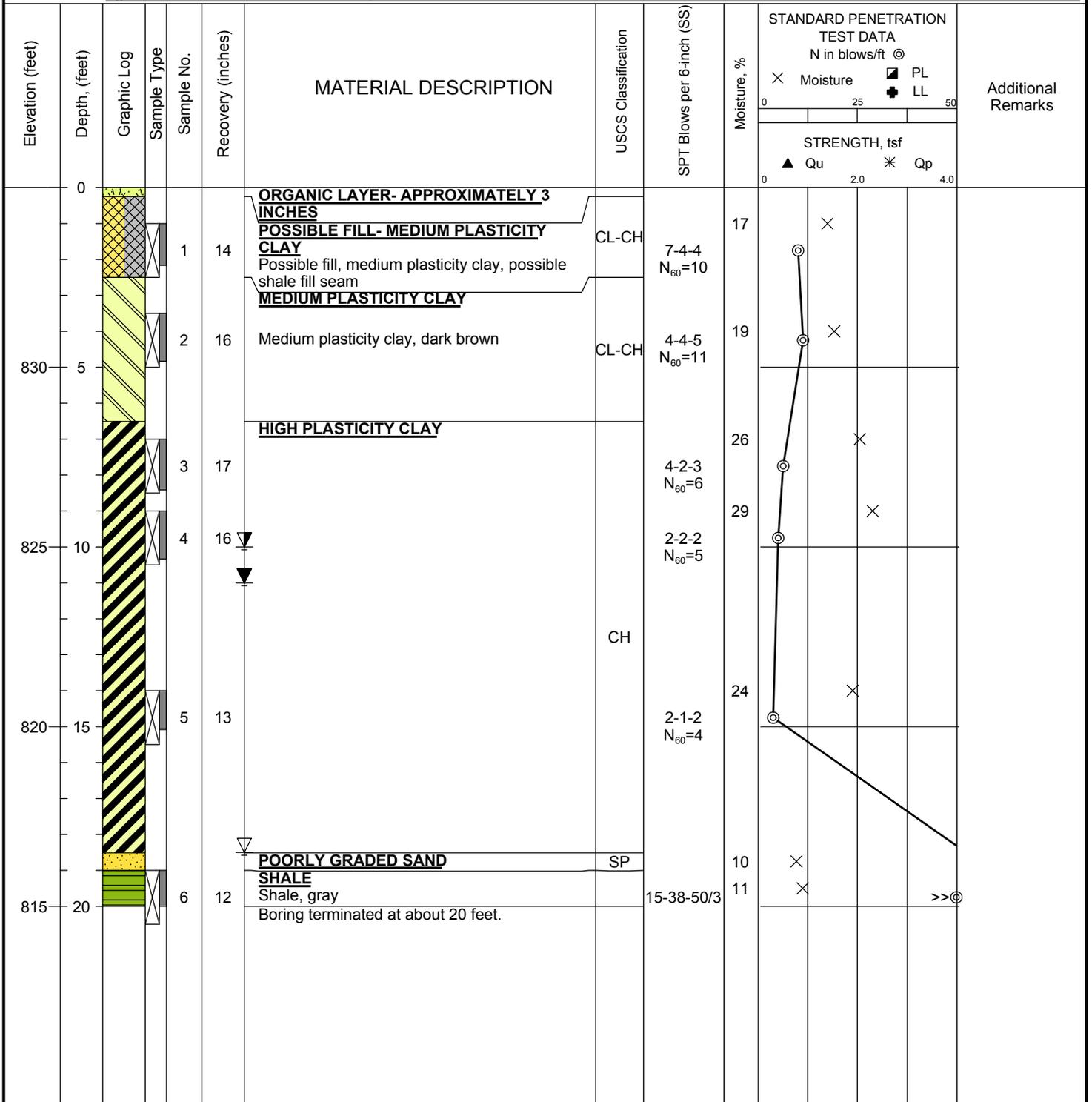
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DATE COMPLETED: 7/20/18
COMPLETION DEPTH: 20.0 ft
BENCHMARK: N/A
ELEVATION: 835 ft
LATITUDE:
LONGITUDE:
STATION: N/A **OFFSET:** N/A
REMARKS: N₆₀ denotes the normalization to 60% efficiency as described in ASTM D4633.

DRILL COMPANY: PSI, Inc.
DRILLER: M. McGoldrick **LOGGED BY:** A. Banks
DRILL RIG: CME-55
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: SS
HAMMER TYPE: Automatic
EFFICIENCY: 75%
REVIEWED BY: C. Dieckmann

BORING B-09

| | | |
|--------------|-------------------|-----------|
| Water | ▽ While Drilling | 18.5 feet |
| | ▼ Upon Completion | 11 feet |
| | ▽ 66 hours | 10 feet |

BORING LOCATION:



Professional Service Industries, Inc.
 1211 W. Cambridge Circle Drive
 Kansas City, KS 66103
 Telephone: (913) 310-1600

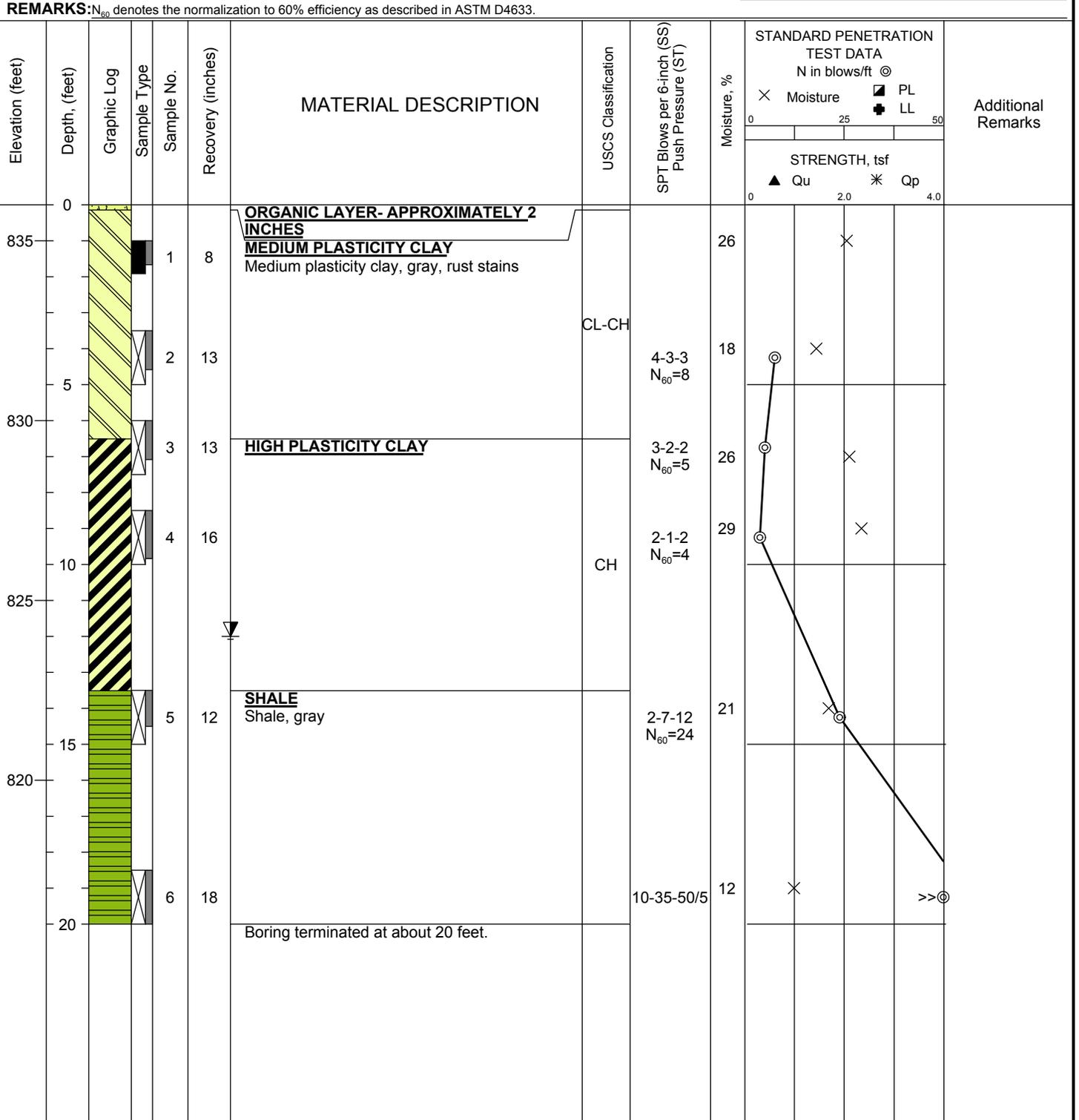
PROJECT NO.: 338-1778
PROJECT: Richard Warren Middle School
LOCATION: 3501 New Lawrence Road
 Leavenworth, KS

DATE STARTED: 7/20/18 **DRILL COMPANY:** PSI, Inc.
DATE COMPLETED: 7/20/18 **DRILLER:** M. McGoldrick **LOGGED BY:** A. Banks
COMPLETION DEPTH: 20.0 ft **DRILL RIG:** CME-55
BENCHMARK: N/A **DRILLING METHOD:** Hollow Stem Auger
ELEVATION: 836 ft **SAMPLING METHOD:** SS/ ST
LATITUDE: **HAMMER TYPE:** Automatic
LONGITUDE: **EFFICIENCY:** 75%
STATION: N/A **OFFSET:** N/A **REVIEWED BY:** C. Dieckmann

BORING B-10

Water
 ∇ While Drilling not observed
 ▼ Upon Completion not observed
 ∇ 67 hours 12 feet

BORING LOCATION:



Professional Service Industries, Inc.
 1211 W. Cambridge Circle Drive
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 Telephone: (913) 310-1600

PROJECT NO.: 338-1778
PROJECT: Richard Warren Middle School
LOCATION: 3501 New Lawrence Road
 Leavenworth, KS

DATE STARTED: 7/20/18 **DRILL COMPANY:** PSI, Inc.
DATE COMPLETED: 7/20/18 **DRILLER:** M. McGoldrick **LOGGED BY:** A. Banks
COMPLETION DEPTH: 17.0 ft **DRILL RIG:** CME-55
BENCHMARK: N/A **DRILLING METHOD:** Hollow Stem Auger
ELEVATION: 837 ft **SAMPLING METHOD:** SS
LATITUDE: **HAMMER TYPE:** Automatic
LONGITUDE: **EFFICIENCY:** 75%
STATION: N/A **OFFSET:** N/A **REVIEWED BY:** C. Dieckmann

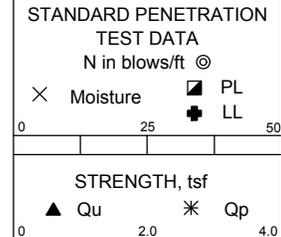
BORING B-11

| | | |
|--------------|-------------------|---------|
| Water | ▽ While Drilling | 17 feet |
| | ▼ Upon Completion | 13 feet |
| | ▽ 68.5 hours | 10 feet |

BORING LOCATION:

REMARKS: N₆₀ denotes the normalization to 60% efficiency as described in ASTM D4633.

| Elevation (feet) | Depth (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STRENGTH, tsf | Additional Remarks |
|------------------|--------------|--|-------------|------------|-------------------|-------------------------------|---------------------|-----------------------------|-------------|---------------|--------------------|
| 0 | 0 | ORGANIC LAYER - APPROXIMATELY 3 INCHES | | | | | | | | | |
| 835 | 1 | MEDIUM PLASTICITY CLAY | | 1 | 14 | Medium plasticity clay, brown | CL-CH | 3-3-4 N ₆₀ =9 | 20 | | |
| 5 | 2 | Medium plasticity clay, gray | | 2 | 16 | | | 2-3-4 N ₆₀ =9 | 27 | | |
| 830 | 3 | HIGH PLASTICITY CLAY | | 3 | 16 | | | 2-2-3 N ₆₀ =6 | 27 | | |
| 10 | 4 | High plasticity clay, brown to gray | | 4 | 17 | | | 2-3-3 N ₆₀ =8 | 25 | | |
| 825 | | High plasticity clay, dark gray | | | | | CH | | 27 | | |
| 15 | 5 | | | 5 | 18 | | | 2-1-2 N ₆₀ =4 | 29 | | |
| 820 | | Auger refusal at about 17 feet. | | | | | | | | | |



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PROJECT NO.: 338-1778
PROJECT: Richard Warren Middle School
LOCATION: 3501 New Lawrence Road
 Leavenworth, KS

DATE STARTED: 7/20/18 **DRILL COMPANY:** PSI, Inc.
DATE COMPLETED: 7/20/18 **DRILLER:** M. McGoldrick **LOGGED BY:** A. Banks
COMPLETION DEPTH: 15.0 ft **DRILL RIG:** CME-55
BENCHMARK: N/A **DRILLING METHOD:** Hollow Stem Auger
ELEVATION: 838 ft **SAMPLING METHOD:** SS
LATITUDE: **HAMMER TYPE:** Automatic
LONGITUDE: **EFFICIENCY:** 75%
STATION: N/A **OFFSET:** N/A **REVIEWED BY:** C. Dieckmann

BORING B-12

| | | |
|--------------|-------------------|--------------|
| Water | ▽ While Drilling | not observed |
| | ▼ Upon Completion | not observed |
| | ▽ 69 hours | not observed |

BORING LOCATION:

REMARKS: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633.

| Elevation (feet) | Depth (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STRENGTH, tsf | Additional Remarks |
|------------------|--------------|-------------|-------------|------------|-------------------|--|---------------------|---------------------------|-------------|---------------|--------------------|
| 0 | 0 | | | | | ORGANIC LAYER- APPROXIMATELY 3 INCHES | | | | | |
| 835 | 3 | | | 1 | 14 | MEDIUM PLASTICITY CLAY Medium plasticity clay, brown | CL-CH | 4-4-5 $N_{60}=11$ | 22 | | |
| 5 | 5 | | | 2 | 18 | Medium plasticity clay, gray, rust stains | CL-CH | 4-4-5 $N_{60}=11$ | 25 | | |
| 830 | 10 | | | 3 | 15 | HIGH PLASTICITY CLAY | CH | 3-4-5 $N_{60}=11$ | 21 | | |
| 10 | 10 | | | 4 | 13 | | CH | 2-3-5 $N_{60}=10$ | 20 | | |
| 825 | 15 | | | 5 | 17 | | CH | 2-3-4 $N_{60}=9$ | 20 | | |
| 15 | 15 | | | | | Auger refusal at about 15 feet | | | | | |



Professional Service Industries, Inc.
 1211 W. Cambridge Circle Drive
 Kansas City, KS 66103
 Telephone: (913) 310-1600

PROJECT NO.: 338-1778
PROJECT: Richard Warren Middle School
LOCATION: 3501 New Lawrence Road
 Leavenworth, KS

DATE STARTED: 7/25/18 **DRILL COMPANY:** PSI, Inc.
DATE COMPLETED: 7/25/18 **DRILLER:** J. Faillace **LOGGED BY:** L. Nelson
COMPLETION DEPTH: 5.0 ft **DRILL RIG:** CME-55
BENCHMARK: N/A **DRILLING METHOD:** Hollow Stem Auger
ELEVATION: 830 ft **SAMPLING METHOD:** SS
LATITUDE: **HAMMER TYPE:** Automatic
LONGITUDE: **EFFICIENCY:** 75%
STATION: N/A **OFFSET:** N/A **REVIEWED BY:** C. Dieckmann

BORING B-13

| | | | |
|--------------|---|-----------------|--------------|
| Water | ▽ | While Drilling | not observed |
| | ▼ | Upon Completion | not observed |
| | ▽ | Delay | N/A |

BORING LOCATION: _____

REMARKS: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633.

| Elevation (feet) | Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STANDARD PENETRATION TEST DATA N in blows/ft ⊙ × Moisture ◼ PL ◼ LL | Additional Remarks |
|------------------|---------------|-------------|-------------|------------|-------------------|--|---------------------|---------------------------|-------------|---|--------------------|
| | | | | | | | | | | STRENGTH, tsf | |
| | | | | | | | | | | ▲ Qu * Qp | |
| 0 | | 1, 2, 3 | | | | ORGANIC LAYER- APPROXIMATELY 3 INCHES | | | | | |
| | | | | 1 | 8 | MEDIUM PLASTICITY CLAY Medium plasticity clay, dark gray | CL-CH | 7-8-6 $N_{60}=18$ | 0 | ⊙ | |
| | | | | 2 | 8 | Medium plasticity clay, gray to brown | | 4-6-5 $N_{60}=14$ | 0 | ⊙ | |
| 825 | 5 | | | | | Boring terminated at about 5 feet. | | | | | |



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 Leavenworth, KS



APPENDIX E – GENERAL NOTES/SOIL CLASSIFICATION CHART

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

| | |
|--|---|
| SFA: Solid Flight Auger - typically 4" diameter flights, except where noted. | ☒ SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted. |
| HSA: Hollow Stem Auger - typically 3 1/4" or 4 1/4" I.D. openings, except where noted. | ■ ST: Shelby Tube - 3" O.D., except where noted. |
| M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry | ▮ RC: Rock Core |
| R.C.: Diamond Bit Core Sampler | ⬇ TC: Texas Cone |
| H.A.: Hand Auger | ☞ BS: Bulk Sample |
| P.A.: Power Auger - Handheld motorized auger | ☒ PM: Pressuremeter |
| | CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings |

SOIL PROPERTY SYMBOLS

| |
|---|
| N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon. |
| N ₆₀ : A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR) |
| Q _u : Unconfined compressive strength, TSF |
| Q _p : Pocket penetrometer value, unconfined compressive strength, TSF |
| w%: Moisture/water content, % |
| LL: Liquid Limit, % |
| PL: Plastic Limit, % |
| PI: Plasticity Index = (LL-PL), % |
| DD: Dry unit weight, pcf |
| ▼, ▼, ▼ Apparent groundwater level at time noted |

RELATIVE DENSITY OF COARSE-GRAINED SOILS

| <u>Relative Density</u> | <u>N - Blows/foot</u> |
|-------------------------|-----------------------|
| Very Loose | 0 - 4 |
| Loose | 4 - 10 |
| Medium Dense | 10 - 30 |
| Dense | 30 - 50 |
| Very Dense | 50 - 80 |
| Extremely Dense | 80+ |

ANGULARITY OF COARSE-GRAINED PARTICLES

| <u>Description</u> | <u>Criteria</u> |
|--------------------|--|
| Angular: | Particles have sharp edges and relatively plane sides with unpolished surfaces |
| Subangular: | Particles are similar to angular description, but have rounded edges |
| Subrounded: | Particles have nearly plane sides, but have well-rounded corners and edges |
| Rounded: | Particles have smoothly curved sides and no edges |

GRAIN-SIZE TERMINOLOGY

| <u>Component</u> | <u>Size Range</u> |
|------------------------|--|
| Boulders: | Over 300 mm (>12 in.) |
| Cobbles: | 75 mm to 300 mm (3 in. to 12 in.) |
| Coarse-Grained Gravel: | 19 mm to 75 mm (¾ in. to 3 in.) |
| Fine-Grained Gravel: | 4.75 mm to 19 mm (No.4 to ¾ in.) |
| Coarse-Grained Sand: | 2 mm to 4.75 mm (No.10 to No.4) |
| Medium-Grained Sand: | 0.42 mm to 2 mm (No.40 to No.10) |
| Fine-Grained Sand: | 0.075 mm to 0.42 mm (No. 200 to No.40) |
| Silt: | 0.005 mm to 0.075 mm |
| Clay: | <0.005 mm |

PARTICLE SHAPE

| <u>Description</u> | <u>Criteria</u> |
|--------------------|---|
| Flat: | Particles with width/thickness ratio > 3 |
| Elongated: | Particles with length/width ratio > 3 |
| Flat & Elongated: | Particles meet criteria for both flat and elongated |

RELATIVE PROPORTIONS OF FINES

| <u>Descriptive Term</u> | <u>% Dry Weight</u> |
|-------------------------|---------------------|
| Trace: | < 5% |
| With: | 5% to 12% |
| Modifier: | >12% |

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

| <u>Q_u - TSF</u> | <u>N - Blows/foot</u> | <u>Consistency</u> |
|----------------------------|-----------------------|---------------------|
| 0 - 0.25 | 0 - 2 | Very Soft |
| 0.25 - 0.50 | 2 - 4 | Soft |
| 0.50 - 1.00 | 4 - 8 | Firm (Medium Stiff) |
| 1.00 - 2.00 | 8 - 15 | Stiff |
| 2.00 - 4.00 | 15 - 30 | Very Stiff |
| 4.00 - 8.00 | 30 - 50 | Hard |
| 8.00+ | 50+ | Very Hard |

MOISTURE CONDITION DESCRIPTION

| <u>Description</u> | <u>Criteria</u> |
|--------------------|---|
| Dry: | Absence of moisture, dusty, dry to the touch |
| Moist: | Damp but no visible water |
| Wet: | Visible free water, usually soil is below water table |

RELATIVE PROPORTIONS OF SAND AND GRAVEL

| <u>Descriptive Term</u> | <u>% Dry Weight</u> |
|-------------------------|---------------------|
| Trace: | < 15% |
| With: | 15% to 30% |
| Modifier: | >30% |

STRUCTURE DESCRIPTION

| <u>Description</u> | <u>Criteria</u> | <u>Description</u> | <u>Criteria</u> |
|--------------------|---|--------------------|---|
| Stratified: | Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick | Blocky: | Cohesive soil that can be broken down into small angular lumps which resist further breakdown |
| Laminated: | Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick | Lensed: | Inclusion of small pockets of different soils |
| Fissured: | Breaks along definite planes of fracture with little resistance to fracturing | Layer: | Inclusion greater than 3 inches thick (75 mm) |
| Slickensided: | Fracture planes appear polished or glossy, sometimes striated | Seam: | Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample |
| | | Parting: | Inclusion less than 1/8-inch (3 mm) thick |

SCALE OF RELATIVE ROCK HARDNESS

| <u>Q_u - TSF</u> | <u>Consistency</u> |
|----------------------------|--------------------|
| 2.5 - 10 | Extremely Soft |
| 10 - 50 | Very Soft |
| 50 - 250 | Soft |
| 250 - 525 | Medium Hard |
| 525 - 1,050 | Moderately Hard |
| 1,050 - 2,600 | Hard |
| >2,600 | Very Hard |

ROCK BEDDING THICKNESSES

| <u>Description</u> | <u>Criteria</u> |
|--------------------|---------------------------------------|
| Very Thick Bedded | Greater than 3-foot (>1.0 m) |
| Thick Bedded | 1-foot to 3-foot (0.3 m to 1.0 m) |
| Medium Bedded | 4-inch to 1-foot (0.1 m to 0.3 m) |
| Thin Bedded | 1¼-inch to 4-inch (30 mm to 100 mm) |
| Very Thin Bedded | ½-inch to 1¼-inch (10 mm to 30 mm) |
| Thickly Laminated | 1/8-inch to ½-inch (3 mm to 10 mm) |
| Thinly Laminated | 1/8-inch or less "paper thin" (<3 mm) |

ROCK VOIDS

| <u>Voids</u> | <u>Void Diameter</u> |
|--------------|---------------------------------|
| Pit | <6 mm (<0.25 in) |
| Vug | 6 mm to 50 mm (0.25 in to 2 in) |
| Cavity | 50 mm to 600 mm (2 in to 24 in) |
| Cave | >600 mm (>24 in) |

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

| <u>Component</u> | <u>Size Range</u> |
|---------------------|--------------------|
| Very Coarse Grained | >4.76 mm |
| Coarse Grained | 2.0 mm - 4.76 mm |
| Medium Grained | 0.42 mm - 2.0 mm |
| Fine Grained | 0.075 mm - 0.42 mm |
| Very Fine Grained | <0.075 mm |

ROCK QUALITY DESCRIPTION

| <u>Rock Mass Description</u> | <u>RQD Value</u> |
|------------------------------|------------------|
| Excellent | 90 - 100 |
| Good | 75 - 90 |
| Fair | 50 - 75 |
| Poor | 25 - 50 |
| Very Poor | Less than 25 |

DEGREE OF WEATHERING

| | |
|---------------------|---|
| Slightly Weathered: | Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact. |
| Weathered: | Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife. |
| Highly Weathered: | Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife. |

SOIL CLASSIFICATION CHART

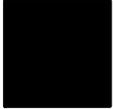
NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

| MAJOR DIVISIONS | | | SYMBOLS | | TYPICAL DESCRIPTIONS | |
|---|--|---|---------|-----------|---|--|
| | | | GRAPH | LETTER | | |
| COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE | GRAVEL AND GRAVELLY SOILS (LITTLE OR NO FINES) | CLEAN GRAVELS | | GW | WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES | |
| | | GRAVELS WITH FINES | | GP | POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES | |
| | | GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES) | | GM | SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES | |
| | SAND AND SANDY SOILS (LITTLE OR NO FINES) | CLEAN SANDS | | SW | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES | |
| | | SANDS WITH FINES | | SP | POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES | |
| | | SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES) | | SM | SILTY SANDS, SAND - SILT MIXTURES | |
| | FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE | SILTS AND CLAYS LIQUID LIMIT LESS THAN 50 | | | ML | INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY |
| | | | | | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS |
| | | | | | OL | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY |
| SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50 | | | | MH | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS | |
| | | | | CH | INORGANIC CLAYS OF HIGH PLASTICITY | |
| | | | | OH | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS | |
| HIGHLY ORGANIC SOILS | | | | PT | PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS | |

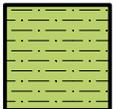
Graphic Symbols for Materials and Rock Deposits



CONCRETE
Portland Cement Concrete



BITUMINOUS CONCRETE



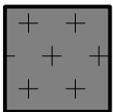
CLAYSTONE



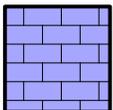
COAL
Coal, Anthracite Coal



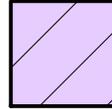
CONGLOMERATE/BRECCIA
Conglomerate, Breccia



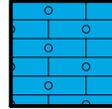
IGNEOUS ROCK
Anorthosite, Basalt, Metabasalt, Diabase (Gabbro), Gabbro, Granite/Granodionite, Homfels, Pegmatite, Rhyolite/Metarhyolite



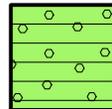
LIMESTONE
Limestone, Dolomite



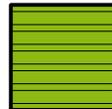
METAMORPHIC ROCK
Amphibolite, Gneiss, Marble, Phyllite, Quartzite, Schist, Serpentinite, Slate



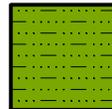
CHERT



SANDSTONE
Sandstone, Orthoquartzite (Sandstone)



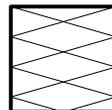
SHALE



SILTSTONE



NO RECOVERY



VOID



APPENDIX F – DRILL, FIELD AND LAB TESTING PROCEDURES



Drilling and Sampling Procedures

The soil borings were performed with a truck-mounted rotary head drill rig. Borings were advanced using 3¼-inch inside diameter hollow-stem augers. Representative samples were obtained employing split-spoon and thin-wall tube sampling procedures in general accordance with ASTM procedures.

Field Tests and Measurements

Penetration Tests and Split-Barrel Sampling of Soils

During the sampling procedure, Standard Penetration Tests (SPT) were performed at regular intervals (2½-foot intervals to 10 feet and 5-foot intervals thereafter) to obtain the standard penetration value (N) of the soil. The results of the standard penetration test indicate the relative density and comparative consistency of the soils, and thereby provide a basis for estimating the relative strength and compressibility of the soil profile components. The split-barrel sampler provides a soil sample for identification purposes and for laboratory tests appropriate for soil obtained from a sampler that may produce large shear strain while obtaining the sample.

Thin-Walled (Shelby) Tube Geotechnical Sampling of Soils

Thin-walled tube samples are utilized to obtain a relatively undisturbed specimen suitable for laboratory tests of structural properties or other tests that might be influenced by soil properties. A relatively undisturbed sample is obtained by pressing a thin-walled metal tube (typically an outside diameter 3 inches) into the in-situ soil, removing the soil-filled tube, and sealing the ends to reduce the soil disturbance or moisture loss. These samples may be utilized in the laboratory to obtain the following information or perform the following tests: Unconfined Compressive Strength (q_u), Laboratory Determination of Water Content, Wet and Dry Density, Percent Saturation, and Atterberg Limits

Water Level Measurements

Water level observations were attempted during and upon completion of the drilling operation using a 100-foot tape measure. The depths of observed water levels in the boreholes are noted on the boring logs presented in the appendix of this report. In the borings where water was unable to be observed during the field activities, in relatively impervious soils, the accurate determination of the groundwater elevation may not be possible even after several days of observation. Seasonal variations, temperature and recent rainfall conditions may influence the levels of the groundwater table and volumes of water will depend on the permeability of the soils.

Laboratory Testing Program

In addition to the field investigation, a supplemental laboratory-testing program was conducted to determine additional engineering characteristics of the foundation materials necessary in analyzing the behavior of the soils as it relates to the construction of the proposed structures. The laboratory testing program is as follows:

Laboratory Determination of Water (Moisture) Content of Soil by Mass

The water content is a significant index property used in establishing a correlation between soil behavior and its index properties. The water content is used in expressing the phase relationship of air, water, and solids in a given volume of material. In fine grained cohesive soils, the behavior of a given soil type often depends on its water content. The water content of a soil along with its liquid and plastic limits as determined by Atterberg Limit testing, is used to express its relative consistency or liquidity index.

Atterberg Limits

The Atterberg Limits are defined by the liquid limit (LL) and plastic limit (PL) states of a given soil. These limits are used to determine the moisture content limits where the soil characteristics changes from behaving more like a fluid on the liquid limit end to where the soil behaves more like individual soil particles on the plastic limit end. The liquid limit is often used to indicate if a soil is a low or high plasticity soil. The plasticity index (PI) is difference between the liquid limit and the plastic limit. The plasticity index is used in conjunction with the liquid limit to assess if the material will behave like a silt or clay. The material can also be classified as an organic material by comparing the liquid limit of the natural material to the liquid limit of the sample after being oven-dried.

Unconfined Compressive Strength of Cohesive Soil (q_u)

The primary purpose of the unconfined compressive strength test is to obtain the undrained compressive strength of soils that possess sufficient cohesion to permit testing in the unconfined state. Unconfined compressive strength (q_u) is the compressive stress at which an unconfined cylindrical specimen of soil will fail in a simple compression test. In this test method, unconfined compressive strength is taken as the maximum load obtained per unit area or the load per unit area at 15% axial strain, whichever is obtained first during the performance of a test. For the unconfined compressive strength test, the shear strength (s_u) is calculated to be half of the compressive stress at failure.

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Owner-furnished products.
5. Access to site.
6. Coordination with occupants.
7. Work restrictions.
8. Specification and Drawing conventions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Leavenworth Intermediate Center.

1. Project Location: 3501 New Lawrence Road; Leavenworth KS 66048.

B. Owner: Leavenworth Unified School District No. 453; 200 North 4th Street; Leavenworth, KS 66048; phone 913-684-1400.

1. Owner's Representative: Matt Dedeke; Director of Facilities; Leavenworth USD No. 453; 200 North 4th Street; Leavenworth, KS 66048; phone 913-684-1400.

C. Architect: DLR Group inc. (a Kansas corporation); 7290 West 133rd Street; Overland Park KS 66213; telephone 913-897-7811.

1. Architect's Project Manager: Robyn O'Roark, RA; DLR Group inc. a Kansas corporation; 7290 West 133rd Street; Overland Park, KS 66213; phone 913-685-5659.

D. Construction Manager: Crossland Construction; 833 South East Avenue; PO Box 45; Columbus KS 66725.

1. Construction Manager’s Representative: Noe Turrubiarres; Nabholz Construction; 17300 West 116th Street; Lenexa, KS 66219; phone 913-393-6571.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 1. New Intermediate Center.
- B. Type of Contract:
 1. Project will be constructed under a Construction Manager as Constructor contract.

1.5 PHASED CONSTRUCTION

- A. The Work shall be conducted in multiple phases, refer to the Construction Manager’s Sequence of Work Schedule.

1.6 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products as follows:

| Owner Provided Items List | | | |
|---------------------------------------|--------------------|---------------------|--|
| Component | Provided By | Installed By | Comments |
| Data Ready TV Message Board | Owner | Contractor | Wall-mounted; provide additional blocking as required, coordinate power and data with Electrical |
| Cot/Exam Table | Owner | Owner | |
| Microwave | Owner | Owner | Coordinate power with Electrical |
| Refrigerator/Freezer (with ice maker) | Owner | Contractor | Provide power, provide water for ice maker |
| Safe | Owner | Owner | |
| Ceiling Mount for Overhead Projector | Owner | Contractor | |
| Overhead Projector | Owner | Contractor | Coordinate power and data with Electrical |
| Copier/Printer | Owner | Owner | Coordinate power with Electrical |
| Interactive White Board | Owner | Contractor | Coordinate power with Electrical |
| Kiln | Owner | Contractor | Coordinate power with Electrical; coordinate vent with Mechanical |
| Pug Mill | Owner | Owner | Coordinate power with Electrical |

1.7 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.8 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

1.9 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. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7 a.m. to 6 p.m., Monday through Friday, unless otherwise indicated.
 - 1. Weekend Hours: As approved by Owner.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Construction Manager not less than three days in advance of proposed utility interruptions.
 2. Obtain Construction Manager's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
1. Notify Construction Manager not less than three days in advance of proposed disruptive operations.
 2. Obtain Construction Manager's written permission before proceeding with disruptive operations.
- E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (8 m) of Project Site.
- F. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.
- G. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- H. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
1. Maintain list of approved screened personnel with Owner's representative.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 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: Provide add alternate pricing for the gym divider curtain in Gymnasium A139 as indicated on the Construction Documents.
- B. Alternate No. 2: Provide add alternate pricing for interior FEMA Frame Type FW-1 in Gymnasium A139 as indicated on the Construction Documents.
- C. Alternate No. 3: Provide add alternate pricing for the Climbing Wall in Gymnasium A139 as indicated on the Construction Documents.
- D. Alternate No. 4: Provide add alternate pricing for the Indoor Slide and Fall Mat in Lobby A114 as indicated on the Construction Documents.
- E. Alternate No. 5: In lieu of thin-brick FB-1 cast into west facing precast panels of Gymnasium Elevation 53 on A5.1, provide composite precast panels with a form finish, vented furring strips and standing seam metal panels applied directly to the precast panel with associated sheet metal enclosures and flashing.

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit each request electronically via email or otherwise as directed by the Architect and Construction Manager as a single file in PDF format. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Forms: Use Form 012500A Substitution Request Form and Form 012500B Contractor's Statement of Conformance.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.

- b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 business days of receipt of request, or seven business days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

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

1.7 SUBSTITUTIONS

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

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

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

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

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

- a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
- b. Requested substitution does not require extensive revisions to the Contract Documents.
- c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- d. Substitution request is fully documented and properly submitted.
- e. Requested substitution will not adversely affect Contractor's construction schedule.

- f. Requested substitution has received necessary approvals of authorities having jurisdiction.
- g. Requested substitution is compatible with other portions of the Work.
- h. Requested substitution has been coordinated with other portions of the Work.
- i. Requested substitution provides specified warranty.
- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

**SUBSTITUTION REQUEST FORM
MUST BE SUBMITTED WITH FORM 012500B
CONTRACTOR'S STATEMENT OF CONFORMANCE**

TO: **DLR Group**
7290 West 133rd Street
Overland Park, Kansas 66213
Phone 913-685-5684
Email in PDF format to: kwalbert@dlrgroup.com and roroark@dlrgroup.com

CONTRACTOR'S REQUEST, WITH SUPPORTING DATA

A. Reason for Substitution Request: _____

B. Specifications to which this request applies: _____
Section Page Paragraph

Product Data for proposed substitution attached (description of product, reference standards, performance and test data.)

Sample is attached. Sample will be sent if requested by Architect/Engineer.

C. Itemized comparison of proposed substitution with product specified:

| | SPECIFIED PRODUCT | PROPOSED SUBSTITUTION |
|------------------------|--------------------------|------------------------------|
| Name/Brand | _____ | _____ |
| Catalog/Model No. | _____ | _____ |
| Manufacturer | _____ | _____ |
| Significant Variations | _____ | _____ |

D. Unit costs of original product and proposed substitution. State whether cost is for

material only, material installed, or Life cycle cost of installed product.

E. Proposed change in Contract Sum:

Credit to Owner: \$ _____ Additional Cost to Owner: \$ _____

F. Proposed Change in Contract Time: Reduce Increase by ____ days No change

G. Effect of proposed substitution on other parts of the Work, or on other Contracts:

**CONTRACTOR'S STATEMENT OF CONFORMANCE
OF PROPOSED SUBSTITUTION TO CONTRACT DOCUMENTS
MUST BE SUBMITTED WITH FORM 012500A REQUEST FOR SUBSTITUTION**

Email in PDF format to kwalbert@dlrgroup.com and roroark@dlrgroup.com
I/ We have investigated the proposed substitution. I/ We

1. believe that it is equal or superior in all respects to the originally specified product, except as stated in Paragraph C of the Post-Bid Request for Substitution Form;
2. will provide the same warranty as required in AIA A201 General Conditions 3.5.1;
3. will provide the same special warranty or guaranty as specified;
4. have included all cost data and cost implications of the proposed substitution;
5. will pay redesign and special inspection costs caused by the use of this product;
6. will pay additional costs to other contractors caused by the substitution;
7. will coordinate the incorporation of the proposed substitution in the Work;
8. will modify other parts of the Work as may be needed, to make all parts of the Work complete and functioning;
9. waive future claims for added cost to Contractor caused by the proposed substitution.

Contractor: _____
 Signature _____ Date _____

 Firm _____ Telephone _____

 Address _____

 City, State Zip _____

ARCHITECT/ENGINEER'S REVIEW AND ACTION

- Provide more information in the following categories. Resubmit.

- Sign Contractor's Statement of Conformance. Resubmit.
- The proposed substitution is approved with the following conditions:

- The proposed substitution request is rejected.

The following changes will be made by Change Order:

Addition to / deduction from the Contract Sum: \$ _____
 Addition to / deduction from the Contract Time: _____ days.

DLR Group

By: _____ Date: _____
 Architect

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. 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.

1.3 MINOR CHANGES IN THE WORK

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

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change 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 after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish

times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Construction Manager.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include costs of labor and supervision directly attributable to the change.
 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 7. Proposal Request Form: Use form acceptable to Architect.

1.5 CHANGE ORDER PROCEDURES

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

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

LEAVENWORTH NEW INTERMEDIATE CENTER
LEAVENWORTH, KANSAS

12-18101-00
BID SET

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect through Construction Manager 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 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 Continuation Sheets.
 3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 5. 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.
 6. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.

2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit One signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 5. Products list (preliminary if not final).
 6. Sustainable design action plans, including preliminary project materials cost data.
 7. Schedule of unit prices.
 8. Submittal schedule (preliminary if not final).
 9. List of Contractor's staff assignments.
 10. List of Contractor's principal consultants.
 11. Copies of building permits.
 12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 13. Initial progress report.
 14. Report of preconstruction conference.
 15. Certificates of insurance and insurance policies.
 16. Performance and payment bonds.
 17. Data needed to acquire Owner's insurance.
- H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

- I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements.
 2. 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.
 5. AIA Document G706A.
 6. AIA Document G707.
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Digital project management procedures.
 - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. Request from Contractor seeking information required by or clarifications of the Contract Documents.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. 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 scheduled activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.

1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.

- g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling, raised access floor, and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor-control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
9. Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.

1.6 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. RFI number, numbered sequentially.
 6. RFI subject.
 7. Specification Section number and title and related paragraphs, as appropriate.
 8. Drawing number and detail references, as appropriate.
 9. Field dimensions and conditions, as appropriate.
 10. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 11. Contractor's signature.
 12. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in PDF format. Submit single file in PDF format with RFI form and all attachments included.
- D. Transmittal of RFI: Upload the RFI to the Architect's Newforma Info Exchange website established for the project.
1. Attachments shall be electronic files in PDF format. Submit single file in PDF format with RFI form and all attachments included. Multiple files will be returned without action.
- E. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven business days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.

- c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect 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 in writing within five days of receipt of the RFI response.
- F. RFI Log: RFI log will be generated from the Newforma Info Exchange website.
- G. On receipt of Architect'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 PROJECT MEETINGS

- A. General: Construction Manager will schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Architect, within three days of the meeting.
- B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. 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.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.

- f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - l. Distribution of the Contract Documents.
 - m. Submittal procedures.
 - n. Preparation of Record Documents.
 - o. Use of the premises and existing building.
 - p. Work restrictions.
 - q. Working hours.
 - r. Owner's occupancy requirements.
 - s. Responsibility for temporary facilities and controls.
 - t. Procedures for disruptions and shutdowns.
 - u. Construction waste management and recycling.
 - v. Parking availability.
 - w. Office, work, and storage areas.
 - x. Equipment deliveries and priorities.
 - y. First aid.
 - z. Security.
 - aa. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Progress Meetings: Construction Manager will conduct progress meetings at biweekly intervals.
1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 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) Off-site fabrication.
 - 6) Access.
 - 7) Site use.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of Proposal Requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
3. 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

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Construction schedule updating reports.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Site condition reports.
 - 7. Unusual event reports.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF file.
- B. Startup construction schedule.
 - 1. Submittal of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- D. Daily Construction Reports: Submit at weekly intervals.
- E. Site Condition Reports: Submit at time of discovery of differing conditions.
- F. Unusual Event Reports: Submit at time of unusual event.

1.4 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
 4. Review delivery dates for Owner-furnished products.
 5. Review submittal requirements and procedures.
 6. Review time required for review of submittals and resubmittals.
 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
 8. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
 9. Review and finalize list of construction activities to be included in schedule.
 10. Review procedures for updating schedule.

1.5 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from entities involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 4. 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.
- 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 by Owner: Include a separate activity for each portion of the Work performed by Owner.
 3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 4. 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.
 5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Building flush-out.
 - m. Startup and placement into final use and operation.
 - n. Commissioning.
 6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.

- c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion
- E. 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.

1.7 CPM SCHEDULE REQUIREMENTS

- A. 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.

1.8 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. Testing and inspection.
 8. Accidents.
 9. Meetings and significant decisions.
 10. Unusual events.
 11. Stoppages, delays, shortages, and losses.
 12. Meter readings and similar recordings.
 13. Emergency procedures.
 14. Orders and requests of authorities having jurisdiction.
 15. Change Orders received and implemented.
 16. Construction Change Directives received and implemented.
 17. Services connected and disconnected.
 18. Equipment or system tests and startups.

19. Partial completions and occupancies.
20. Substantial Completions authorized.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
3. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 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."

1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list 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.

1.5 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Construction Manager.
5. Name of Contractor.
6. Name of firm or entity that prepared submittal.
7. Names of subcontractor, manufacturer, and supplier.
8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
9. Category and type of submittal.
10. Submittal purpose and description.
11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.

B. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect and Construction Manager on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

C. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

D. Submittals for Web-Based Project Software: Prepare submittals as PDF files, or other format indicated by Project software website as directed by the Architect and Construction Manager. Submittal requirements stated by the Architect and Construction Manager must be followed or submittal will be rejected.

1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submittal: Prepare submittals as one PDF file, and transmit to Construction Manager as directed. Include transmittal form. Include information as requested by Architect.
 - a. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
2. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website as directed by Architect and Construction Manager. Enter required data in web-based software site to fully identify submittal.

- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections 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 business 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. Resubmittal Review: Allow 15 business days for review of each resubmittal.
- D. 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 and Construction Manager's action stamp.

1.7 SUBMITTAL REQUIREMENTS

- A. 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 unsuitable 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 that show 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 Shop Drawings, and before or concurrent with Samples. Submit Product Data in PDF electronic format.
- B. 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: Submit Shop drawings in PDF electronic format.
 - 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.
- C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
 4. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.

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.
- D. 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.
- E. 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.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
 1. Certificates and Certifications Submittals: Submit 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. Provide a notarized signature where indicated.

2. 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.
3. 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.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. 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.

H. Test and Research Reports:

1. 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.
2. 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.
3. 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.
4. 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.
5. 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:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.8 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 insufficient 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 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.

1.9 CONTRACTOR'S REVIEW

- A. Action Submittals 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. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include 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.
 1. Architect and Construction Manager will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S AND CONSTRUCTION MANAGER'S REVIEW

- A. Action Submittals: Architect and Construction Manager will review each submittal, indicate corrections or revisions required, and return it.
 1. PDF Submittals: Architect and Construction Manager will indicate, via markup on each submittal, the appropriate action.
 2. Submittals by Web-Based Project Software: Architect and Construction Manager will indicate, on Project software website, the appropriate 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 and Construction Manager 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. Architect and Construction Manager will return without review submittals received from sources other than Contractor.

- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

SECTION 013333 – ELECTRONIC DRAWINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Architect-Engineer, if requested, will provide the Contractor with electronic copies of the Contract Document Drawings for the Work of this Contract. The electronic copy will be provided in a form of the Architect-Engineer's choosing.
- B. There will be no fee for transmitting files requested by the Contractor for the Work of this Project.
- C. The Contractor is solely responsible for requesting electronic files in a timely manner so as not to interfere with the schedule and is required to factor a minimum of fourteen days for the Architect-Engineer to compile and transmit files. The Architect-Engineer will make every effort to transmit files in the timeframe requested; however, under no circumstances will the Contractor be allowed to submit a claim for additional time or money due to the time period required for transmittal of electronic files.

1.3 REFERENCES

- A. A copy of the Architect's AIA Document C106-2013 Digital Licensing Agreement is included at the end of the Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013333



AIA[®] Document C106[™] – 2013

Digital Data Licensing Agreement

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

BETWEEN the Party transmitting Digital Data ("Transmitting Party"):
(Name, address and contact information, including electronic addresses)

DLR Group inc., a Kansas corporation
7290 West 133rd Street
Overland Park, KS 66213

and the Party receiving the Digital Data ("Receiving Party"):
(Name, address and contact information, including electronic addresses)

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

Leavenworth Intermediate Center

The Transmitting Party and Receiving Party agree as follows.

TABLE OF ARTICLES

- 1 GENERAL PROVISIONS
- 2 TRANSMISSION OF DIGITAL DATA
- 3 LICENSE CONDITIONS
- 4 LICENSING FEE OR OTHER COMPENSATION
- 5 DIGITAL DATA

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 The purpose of this Agreement is to grant a license from the Transmitting Party to the Receiving Party for the Receiving Party's use of Digital Data on the Project, and to set forth the license terms.

§ 1.2 This Agreement is the entire and integrated agreement between the parties. Except as specifically set forth herein, this Agreement does not create any other contractual relationship between the parties.

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

§ 1.3 For purposes of this Agreement, the term Digital Data is defined to include only those items identified in Article 5 below.

§ 1.3.1 Confidential Digital Data is defined as Digital Data containing confidential or business proprietary information that the Transmitting Party designates and clearly marks as "confidential."

ARTICLE 2 TRANSMISSION OF DIGITAL DATA

§ 2.1 The Transmitting Party grants to the Receiving Party a nonexclusive limited license to use the Digital Data identified in Article 5 solely and exclusively to perform services for, or construction of, the Project in accordance with the terms and conditions set forth in this Agreement.

§ 2.2 The transmission of Digital Data constitutes a warranty by the Transmitting Party to the Receiving Party that the Transmitting Party is the copyright owner of the Digital Data, or otherwise has permission to transmit the Digital Data to the Receiving Party for its use on the Project in accordance with the terms and conditions of this Agreement.

§ 2.3 If the Transmitting Party transmits Confidential Digital Data, the transmission of such Confidential Digital Data constitutes a warranty to the Receiving Party that the Transmitting Party is authorized to transmit the Confidential Digital Data. If the Receiving Party receives Confidential Digital Data, the Receiving Party shall keep the Confidential Digital Data strictly confidential and shall not disclose it to any other person or entity except as set forth in Section 2.3.1.

§ 2.3.1 The Receiving Party may disclose the Confidential Digital Data as required by law or court order, including a subpoena or other form of compulsory legal process issued by a court or governmental entity. The Receiving Party may also disclose the Confidential Digital Data to its employees, consultants or contractors in order to perform services or work solely and exclusively for the Project, provided those employees, consultants and contractors are subject to the restrictions on the disclosure and use of Confidential Digital Data as set forth in this Agreement.

§ 2.4 The Transmitting Party retains its rights in the Digital Data. By transmitting the Digital Data, the Transmitting Party does not grant to the Receiving Party an assignment of those rights; nor does the Transmitting Party convey to the Receiving Party any right in the software used to generate the Digital Data.

§ 2.5 To the fullest extent permitted by law, the Receiving Party shall indemnify and defend the Transmitting Party from and against all claims arising from or related to the Receiving Party's modification to, or unlicensed use of, the Digital Data.

ARTICLE 3 LICENSE CONDITIONS

The parties agree to the following conditions on the limited license granted in Section 2.1:

(State below rights or restrictions applicable to the Receiving Party's use of the Digital Data, requirements for data format, transmission method or other conditions on data to be transmitted.)

§ 3.1 Architect-Engineer of Record (AER) makes no representation as to the compatibility of the Computer Aided Drafting/Building Information Model (CAD/BIM) files with any hardware or software.

§ 3.2 AER makes no representation regarding the accuracy, completeness, or permanence of CAD/BIM files, or for their merchantability or fitness for a particular purpose. Addenda information or revisions made after the date indicated on the CAD/BIM files may not have been incorporated. In the event of a conflict between the AER's sealed Contract Drawings and CAD/BIM files, the sealed Contract Drawings shall govern. It is the Contractor or Third Party's (OCT) responsibility to determine if any conflicts exist. The CAD/BIM files shall not be considered to be Contract Documents as defined by the General Conditions of the Contract for Construction.

§ 3.3 The use of CAD/BIM files prepared by the AER shall not in any way obviate the OCT's responsibility for the proper checking and coordination of dimensions, details, member sizes and gage, and quantities of materials as required to facilitate complete and accurate fabrication and erection.

§ 3.4 This Agreement shall be governed by the laws of the State of Kansas.

ARTICLE 4 LICENSING FEE OR OTHER COMPENSATION

(Paragraph deleted)

§ 4.1 Parties agree that there will be no compensation for files transmitted for the Work of this Project. Receiving Party agrees that under no circumstances will any claim for additional time or contract sum be allowed due to the transmission of the files under this Agreement. Furthermore, while Transmitting Party will attempt to transmit files requested in the time frame requested by the Receiving Party, Transmitting Party is under no obligation to meet any such schedule requirement. The Receiving Party is solely responsible for submitting a request for files in within a time period such that any delay in transmission does not impact the project schedule.

ARTICLE 5 DIGITAL DATA

The Parties agree that the following items constitute the Digital Data subject to the license granted in Section 2.1: *(Identify below, in detail, the information created or stored in digital form the parties intend to be subject to this Agreement.)*

All files transmitted for the Work of this Project.

This Agreement is entered into as of the day and year first written above and will terminate upon Substantial Completion of the Project, as that term is defined in AIA Document A201™-2007, General Conditions of the Contract for Construction.

(Indicate when this Agreement will terminate, if other than the date of Substantial Completion.)

TRANSMITTING PARTY *(Signature)*

Amber A. Beverlin, AIA, Vice President, DLR
Group inc., a Kansas corporation

(Printed name and title)

RECEIVING PARTY *(Signature)*

(Printed name and title)

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 CONFLICTING REQUIREMENTS

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

1.4 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
 2. Description of test and inspection.
 3. Identification of applicable standards.
 4. Identification of test and inspection methods.
 5. Number of tests and inspections required.
 6. Time schedule or time span for tests and inspections.
 7. Entity responsible for performing tests and inspections.
 8. Requirements for obtaining samples.
 9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. 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.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

- C. **Manufacturer Qualifications:** A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. **Fabricator Qualifications:** A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. **Specialists:** Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- 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 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. **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.
- I. **Preconstruction Testing:** Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

- f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.6 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of 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. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. 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.
- F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

- G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.7 SPECIAL TESTS AND INSPECTIONS

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. 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.

3.3 SCHEDULES

- A. Testing is required by applicable code. See the following Sections and the Drawings:
 - 1. Section 033000 "Cast-in-Place Concrete."
 - 2. Section 034100 "Precast Structural Concrete."
 - 3. Section 042000 "Unit Masonry."
 - 4. Section 051200 "Structural Steel Framing."
 - 5. Section 052100 "Steel Joist Framing"
 - 6. Section 053100 "Steel Decking."
 - 7. Section 312000 "Earthwork."
 - 8. Section 316329 "Drilled Concrete Piers"

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: 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. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
 - 1. AABC - Associated Air Balance Council; www.aabc.com.
 - 2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
 - 3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
 - 4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
 - 5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
 - 6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
 - 7. ABMA - American Boiler Manufacturers Association; www.abma.com.
 - 8. ACI - American Concrete Institute; (Formerly: ACI International); www.abma.com.
 - 9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
 - 10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
 - 11. AF&PA - American Forest & Paper Association; www.afandpa.org.
 - 12. AGA - American Gas Association; www.aga.org.
 - 13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
 - 14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
 - 15. AI - Asphalt Institute; www.asphaltinstitute.org.
 - 16. AIA - American Institute of Architects (The); www.aia.org.
 - 17. AISC - American Institute of Steel Construction; www.aisc.org.
 - 18. AISI - American Iron and Steel Institute; www.steel.org.
 - 19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
 - 20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
 - 21. ANSI - American National Standards Institute; www.ansi.org.
 - 22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
 - 23. APA - APA - The Engineered Wood Association; www.apawood.org.
 - 24. APA - Architectural Precast Association; www.archprecast.org.
 - 25. API - American Petroleum Institute; www.api.org.
 - 26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
 - 27. ARI - American Refrigeration Institute; (See AHRI).

28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; (See ECIA).

72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
73. ECIA - Electronic Components Industry Association; www.eciaonline.org.
74. EIA - Electronic Industries Alliance; (See TIA).
75. EIMA - EIFS Industry Members Association; www.eima.com.
76. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
77. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
78. ESTA - Entertainment Services and Technology Association; (See PLASA).
79. EVO - Efficiency Valuation Organization; www.evo-world.org.
80. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
81. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
82. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
83. FM Approvals - FM Approvals LLC; www.fmglobal.com.
84. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
85. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridarroof.com.
86. FSA - Fluid Sealing Association; www.fluidsealing.com.
87. FSC - Forest Stewardship Council U.S.; www.fscus.org.
88. GA - Gypsum Association; www.gypsum.org.
89. GANA - Glass Association of North America; www.glasswebsite.com.
90. GS - Green Seal; www.greenseal.org.
91. HI - Hydraulic Institute; www.pumps.org.
92. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
93. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
94. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
95. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
96. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
97. IAS - International Accreditation Service; www.iasonline.org.
98. IAS - International Approval Services; (See CSA).
99. ICBO - International Conference of Building Officials; (See ICC).
100. ICC - International Code Council; www.iccsafe.org.
101. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
102. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
103. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
104. IEC - International Electrotechnical Commission; <http://www.iec.ch>.
105. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
106. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
107. IESNA - Illuminating Engineering Society of North America; (See IES).
108. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
109. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
110. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
111. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
112. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
113. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
114. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
115. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.

116. ISO - International Organization for Standardization; www.iso.org.
117. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
118. ITU - International Telecommunication Union; www.itu.int/home.
119. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
120. LMA - Laminating Materials Association; (See CPA).
121. LPI - Lightning Protection Institute; www.lightning.org.
122. MBMA - Metal Building Manufacturers Association; www.mbma.com.
123. MCA - Metal Construction Association; www.metalconstruction.org.
124. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
125. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
126. MHIA - Material Handling Industry of America; www.mhia.org.
127. MIA - Marble Institute of America; www.marble-institute.com.
128. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
129. MPI - Master Painters Institute; www.paintinfo.com.
130. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
131. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
132. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
133. NADCA - National Air Duct Cleaners Association; www.nadca.com.
134. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
135. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
136. NBI - New Buildings Institute; www.newbuildings.org.
137. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
138. NCMA - National Concrete Masonry Association; www.ncma.org.
139. NEBB - National Environmental Balancing Bureau; www.nebb.org.
140. NECA - National Electrical Contractors Association; www.necanet.org.
141. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
142. NEMA - National Electrical Manufacturers Association; www.nema.org.
143. NETA - InterNational Electrical Testing Association; www.netaworld.org.
144. NFHS - National Federation of State High School Associations; www.nfhs.org.
145. NFPA - National Fire Protection Association; www.nfpa.org.
146. NFPA - NFPA International; (See NFPA).
147. NFRC - National Fenestration Rating Council; www.nfrc.org.
148. NHLA - National Hardwood Lumber Association; www.nhla.com.
149. NLGA - National Lumber Grades Authority; www.nlga.org.
150. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
151. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
152. NRCA - National Roofing Contractors Association; www.nrca.net.
153. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
154. NSF - NSF International; www.nsf.org.
155. NSPE - National Society of Professional Engineers; www.nspe.org.
156. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
157. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
158. NWFA - National Wood Flooring Association; www.nwfa.org.
159. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
160. PDI - Plumbing & Drainage Institute; www.pdionline.org.
161. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
162. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
163. RFCI - Resilient Floor Covering Institute; www.rfci.com.

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

- C. 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. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

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

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

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

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.

- c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
 6. MILSPEC - Military Specification and Standards; (See DOD).
 7. USAB - United States Access Board; www.access-board.gov.
 8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
 2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
 3. CDHS; California Department of Health Services; (See CDPH).
 4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
 5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
 6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
 7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservation.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Requirements:
 - 1. Section 015000 "Temporary Facilities and Controls" for temporary site fencing.
 - 2. Section 311000 "Site Clearing" for removing existing trees and shrubs.

1.3 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape at a height 6 inches (150 mm) above the ground for trees up to and including 4-inch (100-mm) size at this height and as measured at a height of 12 inches (300 mm) above the ground for trees larger than 4-inch (100-mm) size.
- B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.
- D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
 - 1. Species and size of tree.
 - 2. Location on site plan. Include unique identifier for each.
 - 3. Reason for pruning.
 - 4. Description of pruning to be performed.
 - 5. Description of maintenance following pruning.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For arborist and tree service firm.
- B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
- D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
 - 1. Use sufficiently detailed photographs or video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.6 QUALITY ASSURANCE

- A. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.

1.7 FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Moving or parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil: Natural or cultivated top layer of the soil profile or manufactured topsoil; containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch (25 mm) in diameter; and free of weeds, roots, and toxic and other non-soil materials.
 - 1. Obtain topsoil only from well-drained sites where topsoil is 4 inches (100 mm) deep or more; do not obtain from bogs or marshes.
- B. Topsoil: Stockpiled topsoil from location shown on Drawings.
- C. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
 - 1. Type: Shredded cypress hardwood.
 - 2. Size Range: 3 inches (76 mm) maximum, 1/2-inch (13 mm) minimum.
 - 3. Color: Natural.
- D. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements.
 - 1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch (50-mm) maximum opening in pattern and weighing a minimum of 0.4 lb/ft. (0.6 kg/m); remaining flexible from minus 60 to plus 200 deg F (minus 16 to plus 93 deg C); inert to most chemicals and acids; minimum tensile yield strength of 2000 psi (13.8 MPa) and ultimate tensile strength of 2680 psi (18.5 MPa); secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 8 feet (2.4 m) apart.
 - a. Height: 4 feet (1.2 m).
 - b. Color: High-visibility orange, nonfading.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Tie a 1-inch (25-mm) blue vinyl tape around each tree trunk at 54 inches (1372 mm) above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3.3 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.
- B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.
- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.4 ROOT PRUNING

- A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as shown on Drawings and as follows:
 - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 - 2. Cut Ends: Coat cut ends of roots more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other coating formulated for use on damaged plant tissues and that is acceptable to arborist.
 - 3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
 - 4. Cover exposed roots with burlap and water regularly.
 - 5. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."

3.5 REGRADING

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
 - 1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.
- C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- D. Minor Fill within Protection Zone: Where existing grade is 2 inches (50 mm) or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.6 FIELD QUALITY CONTROL

- A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.7 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
 - 1. Provide new trees of same size and species as those being replaced for each tree that measures 4 inches (100 mm) or smaller in caliper size.
 - a. Species: As selected by Architect.
 - 2. Plant and maintain new trees as specified in Section 329300 "Plants."

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 015639

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. 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.
 - 2. Section 014200 "References" for applicable industry standards for products specified.

1.3 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 by Architect 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 single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named

product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

1.4 ACTION SUBMITTALS

- A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Form of Architect's Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft 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. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. **Manufacturer's Warranty:** 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 other 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 meeting 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.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
1. Sole 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.
 - a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: ""
 2. Sole 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.
 - a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: ""
 3. Limited List of Products: 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.
 - a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following:"
 4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.

- a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following:"
5. Limited List of Manufacturers: 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.
 - a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following:"
6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.
 - a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following:"
7. 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.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- 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 of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
2. Evidence that proposed product provides specified warranty.
3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
4. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

- B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.

1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
 - a. Contractor's superintendent.
 - b. Trade supervisor responsible for cutting operations.
 - c. Trade supervisor(s) responsible for patching of each type of substrate.
 - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affecting by cutting and patching operations.
2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

PART 2 - PRODUCTS (NOT USED)

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.
 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 1. Description of the Work.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.

- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents 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 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- 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: Where possible, select tools or equipment that minimize production of excessive 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 portions of the Work to confirm that

adequate provisions are made for locating and installing products to comply with indicated requirements.

- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.
 - 1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.4 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: 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 ensure 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. Coordinate startup and adjusting of equipment and operating components with Construction Manager's schedule for the work.
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

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. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Divisions 02 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
 - 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.

7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
 1. Primary operational systems and equipment.
 2. Air or smoke barriers.
 3. Fire-suppression systems.
 4. Mechanical systems piping and ducts.
 5. Control systems.
 6. Communication systems.
 7. Conveying systems.
 8. Electrical wiring systems.
 9. Operating systems of special construction in Division 13 Sections.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:
 1. Water, moisture, or vapor barriers.
 2. Membranes and flashings.
 3. Exterior curtain-wall construction.
 4. Equipment supports.
 5. Piping, ductwork, vessels, and equipment.
 6. Noise- and vibration-control elements and systems.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

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

- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- B. Section includes administrative and procedural requirements for the following:
 - 1. Disposing of nonhazardous demolition and construction waste.

1.3 DEFINITIONS

- C. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- A. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- B. 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.
- C. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- D. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- E. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 DISPOSAL OF WASTE

- D. 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.
- E. Burning: Do not burn waste materials.
- B. 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 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Final completion procedures.
 - 2. Warranties.
 - 3. Final cleaning.
- B. Related Requirements:
 - 1. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 3. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.
 5. Submit testing, adjusting, and balancing records.
 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 6. Advise Owner of changeover in utility services.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements.
 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect 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. 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.

1.6 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, 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.
4. Submit list of incomplete items in the following format:
- a. PDF electronic file. Architect will return annotated file.
 - b. Web-based project software upload. Utilize software feature for creating and updating list of incomplete items (punch list).

1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - 1. Submit on digital media acceptable to Architect.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

- a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
- b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
- c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
- e. Remove snow and ice to provide safe access to building.
- f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- h. Sweep concrete floors broom clean in unoccupied spaces.
- i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
- j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
- k. Remove labels that are not permanent.
- l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
- p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- q. Leave Project clean and ready for occupancy.

- C. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:

1. Submit on digital media acceptable to Architect or by uploading to web-based project software site. Enable reviewer comments on draft submittals.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: 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. Name and contact information for Contractor.
 5. Name and contact information for Construction Manager.
 6. Name and contact information for Architect.
 7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 8. 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. 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."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
 - 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
 - 2. 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.
 - 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

- A. 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.
- B. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- C. 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.
- D. 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.
- E. 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.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
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.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- C. 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.

D. 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.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

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.

B. 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 warranties and bonds as described below.

C. 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.

- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; 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.
 - a. 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.
 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.
- E. 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.
- F. 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.
- G. 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.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. 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.

1.11 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. 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.
- C. 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.
- D. 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.
- E. 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.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. 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 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- B. Related Requirements:
 - 1. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Final Submittal:
 - 1) Submit record digital data files and three set(s) of record digital data file plots.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Annotated PDF electronic file with comment function enabled.
 2. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.

- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect and Construction Manager.
 - e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 5. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file.

1.6 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file.
1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store record documents 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 and Construction Manager's reference during normal working hours.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.
 - 2. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.6 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Systems and equipment operation manuals.
 - c. Systems and equipment maintenance manuals.
 - d. Product maintenance manuals.
 - e. Project Record Documents.
 - f. Identification systems.
 - g. Warranties and bonds.
 - h. 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.

1.7 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

- B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 - 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner through Construction Manager, with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

1.9 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode.
 - 1. Submit video recordings on CD-ROM or thumb drive.
 - 2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.
 - 3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.
 - 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:

- a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. Email address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017900

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 COMMISSIONING PROCESS

1. The construction manager is responsible for obtaining from contractors all documentation related to the commissioning effort and submitting it to the commissioning authority.
2. All system and equipment startup will be conducted by the respective manufacturers and contractors.
3. Functional and integrated testing shall be performed by the contractors and supervised, witnessed, and verified by the commissioning authority.
4. This specification is to be used in conjunction with all other contract documents. Any discrepancies or conflicts shall be identified, and the Owner and Construction Manager shall be notified in writing. A clarification will then be issued to the appropriate parties and entities.

1.3 SUMMARY

- A. Section Includes:

1. General requirements for coordinating and scheduling commissioning activities.
2. Commissioning reports.
3. Use of commissioning process test equipment, instrumentation, and tools.
4. Construction checklists, including, but not limited to, startup.
5. Commissioning tests.

- B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submittal procedure requirements for commissioning process.
2. Section 017700 "Closeout Procedures" for Certificate of Construction-Phase Commissioning Process Completion submittal requirements.
3. Section 017823 "Operation and Maintenance Data" for preliminary operation and maintenance data submittal requirements.
4. Section 230800 "Commissioning of HVAC" for technical commissioning requirements for HVAC.

1.4 DEFINITIONS

- A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.
- B. Basis-of-Design Document: A document prepared by Architect that records concepts, calculations, decisions, and product selections used to comply with Owner's Project Requirements and to suit applicable regulatory requirements, standards, and guidelines.
- C. Commissioning Authority/Provider: An entity engaged by Owner, and identified in Section 011000 "Summary," to evaluate Commissioning-Process Work.
- D. Commissioning Plan: A document, prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation of commissioning requirements.
- E. Commissioning: A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with Owner's Project Requirements. The requirements specified here are limited to the construction phase commissioning activities.
- F. Construction-Phase Commissioning-Process Completion: The stage of completion and acceptance of commissioning process when resolution of deficient conditions and issues discovered during commissioning process and retesting until acceptable results are obtained has been accomplished. Owner will establish in writing the date construction-phase commissioning-process completion is achieved.
 - 1. Commissioning process is complete when the Work specified of this Section and related Sections has been completed and accepted, including, but not limited to, the following:
 - a. Completion of tests and acceptance of test results.
 - b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
 - c. Comply with requirements in Section 017900 "Demonstration and Training."
 - d. Completion and acceptance of submittals and reports.
- G. Owner's Witness: Commissioning Authority, Owner's Project Manager, or Architect-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.
- H. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.
- I. Test: Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.
- J. Sampling Procedures and Tables for Inspection by Attributes: As defined in the Commissioning Plan.

1.5 INFORMATIONAL SUBMITTALS

- A. Comply with requirements in Section 013300 "Submittal Procedures" for submittal procedure general requirements for commissioning process.
- B. Commissioning Plan Information:
 - 1. List of Contractor-appointed commissioning team members to include specific personnel and subcontractors performing the various commissioning requirements.
 - 2. Schedule of commissioning activities, integrated with the Construction Schedule. Comply with requirements in Section 013200 "Construction Progress Documentation" for the Construction Schedule general requirements for commissioning process
- C. Commissioning schedule. Include commissioning activities in the overall project schedule. Coordinate with the CxA to determine the amount of time to allocate for each assembly or system test. Allow for adequate time to test assemblies and systems prior to substantial completion of the project.
 - 1. In cooperation with the CxA, the contractor shall integrate commissioning activities into the master construction schedule.
- D. Two-week look-ahead schedules provided to the commissioning authority by the general contractor.
- E. Test Reports:
 - 1. Startup Report: Prior to startup of equipment or a system, submit signed, completed construction (pre-functional) checklists and when installation is completed, and equipment has been started submitting signed, completed manufacturer startup reports.
 - 2. Test Data Reports: At the end of each day in which tests are conducted, submit test data for tests performed via CxAlloy clouded-based software.
 - 3. Commissioning Issue Reports: weekly, at the end of each week in which tests are conducted, submit commissioning issue reports for tests for which acceptable results were not achieved.
 - a. Issues are recorded utilizing the CxAlloy software. Issues are assigned to the appropriate party for resolution.
- F. Construction Checklists:
 - 1. Equipment received checks.
 - 2. Installation checklists.
 - 3. Startup procedures, where required.

1.6 CONTRACTOR RESPONSIBILITIES

- A. Complete all equipment checklists, startup reports and any owner related documentation pertaining to the project and the equipment.

- B. Prepare for the Construction Manager a preliminary schedule for commissioning activities for use by the Commissioning Authority and shall update the schedule as appropriate. Acting through the Construction Manager, the contractor shall notify the Commissioning Authority during the commissioning meetings when commissioning activities not yet performed or not yet scheduled will delay construction. Perform equipment installation and start up.
- C. Confirm completion of the test, adjust and balancing contractor responsibilities, draft report submitted to the design engineer of record and their review completed and the final report accepted. Copy of draft report is to be provided as well to the owner's representative and the CxA.
- D. Control contractor responsibilities completed including graphics and training has been scheduled with the owner's maintenance staff.
- E. Verify the functional readiness of systems to be tested prior to scheduling and demonstrating the functional operational performance.
- F. Correct current Architect/Engineer punch list and Commissioning Authority deficiency items before functional and integrated performance testing can begin. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air or water related systems. Conduct functional performance testing in the presence of the CxA.
- G. Correct deficiencies.
- H. Perform functional performance retest if necessary.
- I. Contractor shall provide a minimum of 48 hours' notice to the owner's representative of any changes in date, time, and location or anticipated duration of start-up and test activities.
- J. Tests that are not performed as scheduled shall be considered a failed test unless a minimum 48 hours' notification of cancellation or rescheduling was received by all parties. Contractor shall reimburse the owner for costs incurred by the owner as the result of failure to provide timely notice of changes in date, time, location, or anticipated duration of start-up and test activities, including costs associated with the CxA involvement.
 - 1. At Construction-Phase Commissioning Completion, include the following:
 - a. Pre-startup reports.
 - b. Approved test procedures
 - c. Test data forms, completed and signed.
 - d. Progress reports.
 - e. Commissioning issue report log.
 - f. Commissioning issue reports showing resolution of issues.
 - g. Correspondence or other documents related to resolution of issues.
 - h. Other reports required by commissioning process.
 - i. List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction-Phase Commissioning Completion.
 - j. Report shall include commissioning work of Contractor.
- K. Certificate of Construction-Phase Commissioning Process Completion.

- L. Operation and maintenance data.

1.7 QUALITY ASSURANCE

- A. Testing Technician Qualifications: Technicians to perform Cx tests, shall have the following minimum qualifications:
 1. Journey level or equivalent skill level with knowledge of BAS, HVAC, electrical concepts, plumbing concepts and building operations.
 2. Generally, required knowledge includes HVAC systems, electrical concepts, building operations, plumbing applications and use of tools and instrumentation to measure performance of equipment, assemblies, and systems.
 3. Minimum three years' experience installing, servicing, and operating systems manufactured by approved manufacturer.
 4. If required, test documents or letters of attendance may be requested for individuals attending training for the installation of the equipment or controls system.
 5. This applies to the individual testing technician, not the contactors company.
 6. This applies to all trades participating in the commissioning process, including specialty trades for example lighting control systems, elevators or building exteriors for example.

1.8 COMMISSIONING OVERVIEW

- A. The following provides a brief overview of typical commissioning tasks during construction and general order in which they occur.
 1. CxA provides a commissioning plan to outline the commissioning process including the roles and responsibilities of the owner, design professional, and commissioning agent. The plan shall also identify the logistics, schedules and management protocols associated with the commissioning process.
 2. Contractors submit normal comprehensive product and execution submittals as specified.
 3. Design team reviews submittals and returns to contractors. CxA reviews submittals for equipment/systems in the commissioning program simultaneously with design team and submits comments to design team.
 4. Design professional receives and reviews O&M manuals and submittals. The Construction Manager is to copy the CxA to allow their review for conformance to project intent.
 5. Provide documentation through the Construction Manager to the Commissioning Authority for development of pre-installation, installation, check, test, and start-up, and functional and Integrated performance testing procedures, prior to normal O&M manual submittals when practical. This documentation shall include detailed manufacturer installation, start-up, operating, troubleshooting and maintenance procedures; full details of any owner-contracted tests; fan and pump curves; full factory testing reports, if any; and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory-trained manufacturer's field technicians shall be submitted to the Commissioning Authority. The Commissioning Authority may request further documentation necessary for the development of functional performance testing and the commissioning process. This data request may be made prior to normal submittals.

6. CxA completes development of functional performance tests based on submitted documentation and submits to commissioning team for review and comment, approximately one week prior to functional performance testing. Final format of testing protocols, based on review comments, are prepared by CxA and distributed.
7. The contractor coordinates proper installation of equipment. The contractor coordinates proper testing and balancing of the systems.
8. Assist in clarifying the proposed operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
9. Functional performance testing for a system shall be scheduled upon completion of equipment installation, equipment startup, and system testing and balancing. The contractor with responsibility for the functionality of a system demonstrates system functionality to CxA.
10. CxA compiles final commissioning report recommending acceptance of performance and functionality or recommends remedial action and
11. Re-testing. The final commissioning report outlines the functional testing procedures, summarizes the results of the functional performance testing, and identifies any outstanding deficiencies.

PART 2 - PRODUCTS

2.1 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

- A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate, or perform work on its equipment.
 1. Identify proprietary test equipment, instrumentation, and tools required in the test equipment identification list submittal.
 2. Proprietary test equipment, instrumentation, and tools shall become the property of Owner at Substantial Completion.

2.2 REPORT FORMAT AND ORGANIZATION

- A. General Format and Organization:
 1. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.
- B. Commissioning Report:
 1. Include a table of contents and an index to each test.
 2. Include major tabs for each Specification Section.
 3. Include minor tabs for each test.
 4. Within each minor tab, include the following:
 - a. Test specification.

- b. Checklist reports.
- c. Completed test procedures.
- d. Test data forms, completed and signed.

PART 3 - EXECUTION

3.1 CONSTRUCTION CHECKLISTS

- A. Construction checklists cannot modify or conflict with the Contract Documents.
- B. The CxA creates construction checklists based on actual systems and equipment to be included in Project.
 - 1. The construction checklists are completed by the contractor and sub-contractors relevant to the piece of equipment or system.
- C. Material Checks: Compare specified characteristics and approved submittals with materials as received.
 - 1. Service connection requirements, including configuration, size, location, and other pertinent characteristics.
 - 2. Included optional features.
 - 3. Equipment Received Check: Inspect and record physical condition of materials and equipment on delivery to Project site, including agreement with approved submittals, cleanliness, and free of damage.
 - 4. Installation Checks:
 - a. Location according to Drawings and approved Shop Drawings.
 - b. Configuration.
 - c. Compliance with manufacturers' written installation instructions.
 - d. Attachment to structure.
 - e. Access clearance to allow for maintenance, service, repair, removal, and replacement without the need to disassemble or remove other equipment or building elements. Access coordinated with other building elements and equipment, including, but not limited to, ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.
 - f. Utility connections are of the correct characteristics, as applicable.
 - g. Correct labeling and identification.
 - h. Startup Checks: Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.
- D. Startup: Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, at minimum.
- E. Performance Tests:
 - 1. Static Tests: As specified elsewhere, including, but not limited to, duct and pipe leakage tests, insulation-resistance tests, and water-penetration tests if necessary.

2. Component Performance Tests: Tests evaluate the performance of an input or output of components under a full range of operating conditions.
3. System Performance Tests: Test and evaluate performance of systems under a full range of operating conditions and loads.
4. Intersystem Performance Tests: Test and evaluate the interface of different systems under a full range of operating conditions and loads.

3.2 GENERAL EXECUTION REQUIREMENTS

- A. Schedule and coordinate commissioning process with the Construction Schedule.
- B. Perform activities identified in construction checklists, including tests, and document results of actions as construction proceeds.
- C. Perform test demonstrations for Owner's witness. The sampling rate if not defined in the Commissioning Plan will require the Commissioning Authority to demonstrate tests for 100 percent of work to which the test applies.
 1. Include in the Commissioning Plan a detailed list of the test demonstrations with lot and sample quantities for each test.
- D. Report test data and commissioning issue resolutions.
- E. Schedule personnel to participate in and perform Commissioning-Process Work.
- F. Installing contractors' commissioning responsibilities include, but are not limited to, the following:
 1. Operating the equipment and systems they install during tests.
 2. In addition, installing contractors may be required to assist in tests of equipment and systems with which their work interfaces.

3.3 COMMISSIONING AUTHORITY RESPONSIBILITIES

- A. Management and Coordination: Manage, schedule, and coordinate commissioning process, including, but not limited to, the following:
 1. Coordinate with subcontractors on their commissioning responsibilities and activities.
 2. Obtain, assemble, and submit commissioning documentation.
 3. Develop and maintain the commissioning schedule. Work with the contractor to integrate commissioning schedule into the Construction Schedule.
 4. Report inconsistencies and issues in system operations.
 5. Verify that tests have been completed and results comply with acceptance criteria, and that equipment and systems are ready before scheduling test demonstrations.
 6. Direct and coordinate test demonstrations.
 7. Prepare and submit specified commissioning reports.
 8. Track commissioning issues until resolution and retesting is successfully completed.
 9. Assemble and submit commissioning report.

3.4 COMMISSIONING TESTING

- A. Quality Control: Construction checklists, including tests, are quality-control tools designed to improve the functional quality of Project. Test demonstrations evaluate the effectiveness of Contractor's quality-control process.
- B. Owner's witness may be present to witness commissioning work requiring the signature of an owner's witness, including, but not limited to, test demonstrations. Owner's project manager will coordinate attendance by Owner's witness with Contractor's published Commissioning Schedule. Owner's witness will provide no labor or materials in the commissioning work. The only function of Owner's witness will be to observe and comment on the progress and results of commissioning process.
- C. Test Procedures and Test Data Forms:
 - 1. Test procedures shall define the step-by-step procedures to be used to execute tests and test demonstrations.
 - 2. Test procedures shall be specific to the make, model, and application of the equipment and systems being tested.
 - 3. Completed test data forms are the official records of the test results.
- D. Performance of Tests:
 - 1. The sampling rate for test demonstrations is 100 percent unless otherwise indicated in the Commissioning Plan.
 - 2. Perform and complete each step of the approved test procedures.
 - 3. Record data observed during performance of tests utilizing the CxAlloy application at the time of test performance and when the results are observed.
 - 4. Record test results that are not within the range of acceptable results on commissioning issue report forms in addition to recording the results on approved test procedures.
- E. Performance of Test Demonstration:
 - 1. Notify Owner's witness at least three days in advance of each test demonstration.
 - 2. Perform and complete each step of the approved test procedures in the order listed.
 - 3. Record data observed during performance of test demonstrations on approved data forms at the time of demonstration and when the results are observed.
 - 4. Provide full access to Owner's witness to directly observe the performance of all aspects of system response during the test demonstration.
 - 5. False load test requirements are specified in related sections.
 - a. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply the specified load to the system. False load system shall be capable of steady-state operation and modulation at the level of load specified. Equipment and systems permanently installed in this work shall not be used to create the false load without Architect's written approval.
- F. Commissioning Compliance Issues:

1. Test results that are not within the range of acceptable results are commissioning compliance issues.
2. Test Results: If a test demonstration fails to meet the acceptance criteria, perform the following:
 - a. Document the issue in the Commissioning Issue Log.
 - b. Establish responsibility for corrective action if the failure is due to conditions found to be Contractor's responsibility.
 - c. Submit notification of issue resolution via the CxAlloy. Retesting shall be scheduled with the CxA when corrective action has been completed.
3. Commissioning Compliance Issue Report: Commissioning Issues are documented utilizing the CxAlloy software. Provide a commissioning compliance issue report for each issue shall be documented utilizing the CxAlloy software.
 - a. Resolve commissioning compliance issues promptly.
4. Do not correct commissioning compliance issues during test demonstrations.
 - a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than 15 minutes. If corrections are made under this exception, note the deficient conditions on the test data form and issue a commissioning compliance issue report. A new test data form, marked "Retest," shall be initiated after the resolution has been completed.

3.5 SEQUENCING

- A. Sequencing of Commissioning Verification Activities: For a particular material, item of equipment, assembly, or system, perform the following in the order listed unless otherwise indicated:
 1. Performance Tests:
 - a. Static tests, as appropriate.
 - b. Component performance tests. Some component performance tests may depend on completion of startup. Such component performance tests may follow startup.
 - c. System performance tests.
 2. Commissioning tests are directed and witnessed by the CxA and executed by the controls sub-contractor with assistance as needed by the installing sub-contractors.
- B. Before performing commissioning tests, verify that materials, equipment, assemblies, and systems are delivered, installed, started, and adjusted to perform according to construction checklists.
- C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing test demonstrations. Notify Architect, CxA, and Owner if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.

- D. Test and Balance must be completed prior to the commencement of functional testing. Provide a preliminary TAB report to the CxA when complete.
- E. Building automation systems programming and graphics must be complete prior the the commencement of functional testing. Controls contractor shall complete point to point checkout of the building automation system and provide documentation checklist indicating that the point to point checks have been completed. Point to point checks will be randomly reviewed by the CxA. If more than 50% of the points are not verified, the controls contractor shall repeat the point to point testing prior to the commencement of functional testing.
- F. Prior to scheduling and execution of the performance tests, the contractor / sub-contractor may be requested to complete a Certificate of Readiness to confirm the equipment is ready to test and all punch list items have been addressed.
- G. Commence tests as scheduled and after installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided the incomplete work does not interfere with successful execution of test.

3.6 CERTIFICATE OF READINESS

- A. Certificate of Readiness:
 - 1. Certify systems ready for functional performance testing on a Certificate of Readiness provided by the Commissioning Authority. The Construction Manager shall not permit a contractor to begin functional testing without the signature of the Commissioning Authority, which shall be affixed to the Certificate of Readiness. The Owner and Commissioning Authority are the sole arbiters of system readiness. Costs shall be apportioned as follows:
 - a. The cost for Owner personnel and the Commissioning Authority to reschedule a functional performance test, made necessary because an item certified by a signatory to the Certificate of Readiness to be ready is found incomplete or faulty, shall be charged to the responsible party.
 - b. For a deficiency identified during functional testing, not identified during the static installation inspection, the Owner through the Commissioning Authority shall direct re-testing of the equipment once at no charge for their time. All costs for subsequent retesting shall be charged to the responsible party.
 - c. Items left incomplete by a contractor, and later causing deficiencies or delays during functional testing may result in back charges to the responsible party.
 - B. Contractor shall promptly correct deficient conditions and issues discovered during commissioning process. Costs of correcting such deficient conditions and issues, including additional testing and inspections, the cost of uncovering and replacement, and compensation for Commissioning Authority's services and expenses made necessary thereby, shall be at Contractor's expense.
 - C. If the Commissioning Authority performs additional services or incur additional expenses due to actions of Contractor listed in this specification, compensate the Owner to refund the Commissioning Authority for such additional services and expenses.

1. Failure to provide timely notice of commissioning activities schedule changes.
 2. Failure to meet acceptance criteria for test demonstrations.
- D. Contractor shall compensate Owner for such additional services and expenses at the rate of \$175 per labor hour, plus \$1000 per round trip for personnel travelling more than 200 miles, plus per diem allowances for meals and lodging according to current U.S. General Services Administration (GSA) Per Diem Rates.

3.7 COMMISSIONING REPORTS

A. Test Reports:

1. Testing reports include the following:
 - a. Test report are included in the CxAlloy software application and shall be recorded utilizing the application.
 - b. "As-tested" system configuration. Complete record of conditions under which the test was performed, including, but not limited to, the status of equipment, systems, and assemblies; temporary adjustments and settings; and ambient conditions.
 - c. Data and observations, including, but not limited to, data trend logs, recorded during the tests.
 - d. Names of individuals performing and witnessing tests.
 - e. Data trend logs accumulated overnight from the previous day of testing.
2. Commissioning Compliance Issue Reports: Utilize the CxAlloy application to report commissioning compliance issues that arise as the result of tests and test demonstrations that do not comply with acceptance criteria. Report only one issue per commissioning compliance issue report. Assign commissioning compliance issue reports to parties responsible for taking corrective action. Identify the following:
 - a. Commissioning compliance issue report number.
 - b. Action distribution list.
 - c. Report date.
 - d. Equipment identification and location.
 - e. Briefly describe observations about the performance associated with failure to achieve acceptable results. Identify the cause of failure if apparent.
3. Periodic progress reports include information for tests conducted since the preceding report and the following:
 - a. Completed data forms.
 - b. Equipment or system tested, including test number, system or equipment tag number and location, and notation about the apparent acceptability of results.
 - c. Activities scheduled but not conducted per schedule.
 - d. Commissioning compliance issue report log.
4. Data trend logs shall be initiated and running prior to the time scheduled for the test demonstration.

- a. Trend log data format shall be multiple data series graphs. Where multiple data series are trend logged concurrently, present the data on a common horizontal time axis. Individual data series may be presented on a segmented vertical axis to avoid interference of one data series with another, and to accommodate different axis scale values. Graphs shall be sufficiently clear to interpret data within the accuracy required by the acceptance criteria.
- b. Attach to the data form printed trend log data collected during the test or test demonstration.
- c. Record, print out, and attach to the data form operator activity during the time the trend log is running. During the time the trend log is running, operator intervention not directed by the test procedure invalidates the test results.

END OF SECTION 019113

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Demolition and removal of selected portions of building or structure.
- 2. Demolition and removal of selected site elements.

- B. Related Requirements:

- 1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
- 2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
- 3. Section 017300 "Execution" for cutting and patching procedures.
- 4. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Engineering Survey: Submit engineering survey of condition of building.
- C. Proposed Protection Measures: Submit 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.
- D. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- E. 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.

- F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

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

1.9 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.11 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- 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 selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.
- E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs or video.
 - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. Arrange to shut off utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

4. Cover and protect furniture, furnishings, and equipment that have not been removed.
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
 1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

3.8 CLEANING

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

END OF SECTION 024119

SECTION 031230 – GEOFOAM CONCRETE FORMS

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. System Description:
 - 1. Provide Geo-foam blocks to provide supporting formwork for concrete floor slabs.
- B. Related Sections include the following:
 - 1. Section 033000 "Cast-in-Place Concrete" for concrete reinforcing and slabs poured on top of permanent form system.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the work include, but are not limited to, the following:
 - 1. ACH Foam Technologies, Inc.; phone 913-321-4114; www.achfoam.com.

2. Foam Products Corporation; St. Louis, MO; phone 314-739-8100; www.fpcfoam.com.
3. Insulfoam, a Carlisle Company.
4. NoArk Enterprises, Inc.; Little Rock, AR; phone 501-945-1114; www.noarkcontrol.com.
5. Universal Construction Foam; phone 410-285-8300; www.universalconstructionfoam.com.

2.2 MATERIALS

- A. Molded, Rigid Cellular Polystyrene Geo-Foam Blocks: Comply with manufacturer's requirements, ASTM D6817 for Type EPS15, and the following:
1. Minimum Density: 0.90 pounds per cubic foot.
 2. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, per ASTM E 84.
 3. Minimum Compressive Resistance: at 1% deformation = 3.6 pounds per square inch (518 pounds per square foot).
 4. Blocks shall contain no CFC's, HCFC's, HFC's, or formaldehyde.

2.3 FABRICATION

- A. Fabricate geo-foam blocks, square, and true to dimension.
- B. Factory cut individual blocks for delivery to site and installation without the need for subsequent field cutting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install system in compliance with Drawings and manufacturer's recommendations.

END OF SECTION 031230

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. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings and grade beams.
 - 2. Drilled piers.
 - 3. Foundation walls.
 - 4. Slabs-on-grade.
 - 5. Slabs on metal deck.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with fly ash; subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures each with its own identification number when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Indicate the minimum following information:
 - 1. Mix Identification Number.
 - 2. Mix-use type.
 - 3. Required 28-day compressive strength.
 - 4. Cement content.
 - 5. Coarse aggregate type and quantity.
 - 6. Fine aggregate type and quantity.
 - 7. Total aggregate gradation.
 - 8. Water quantity.
 - 9. Admixture types and quantity.

10. Slump measurement.
 11. Air content.
 12. 28-day shrinkage rate.
 13. 28-day concrete strength test.
 14. Alkali Silicate Reactivity (ASR).
 15. Chloride-ion content.
 16. Amounts of mixing water to be withheld for later addition at Project site.
- D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, licensed in the state which the project is located, detailing fabrication, assembly, and support of formwork.
- F. Concrete Slab Joint Plan: Prepare a concrete joint plan indicating construction, contraction, control and expansion joints, as well as proposed start and stop of concrete pour joints, for review and approval.
- G. Welding certificates.
- H. Qualification Data: For manufacturer and testing agency.
- I. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- J. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.
 4. Steel reinforcement and accessories.
 5. Waterstops.
 6. Curing compounds.
 7. Bonding agents.
 8. Adhesives.
 9. Vapor retarders.
 10. Semi-rigid joint filler.
 11. Joint-filler strips.
 12. Repair materials.
- K. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.
- L. Field quality-control test reports.

- M. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be 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.
- C. Moisture Vapor Reduction Admixture Testing Agent Qualifications:
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Sections.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. 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.
 - e. Architect.
2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, anchor rod and anchorage device installation tolerances, steel reinforcement installation, concrete repair procedures, and concrete protection.
- I. Protection: No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential. Protect areas to receive a sealed concrete finish during construction to prevent oils, dirt, metal, excessive water and other damaging materials from affecting the finished concrete surface. Protection measures listed below shall begin immediately after the concrete slab is poured:
1. Hydraulic powered equipment shall be diapered to avoid staining of the concrete.
 2. Vehicle parking shall be prohibited on the finish slab area. If necessary to complete their scope of work, drop cloths shall be placed under vehicles at all times.
 3. No pipe cutting machine shall be used on the finish floor slab.
 4. Steel shall not be placed on the finish slab to avoid rusting.
 5. Acids and acidic detergents will not come in contact with slab.
 6. All equipment used on the finish slab shall be equipped with non-marking tires.
 7. Painters shall use drop cloths on the concrete. Remove paint stains immediately.
 8. Construction trades shall be informed that the slab must be protected at all times.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.7 WARRANTY

- A. Moisture Vapor Reduction Admixture (MVRA):
 1. MVRA must be installed according to, and in compliance with, the manufacturer's published data sheet to include, but not limited to:
 - a. Dosing instructions.
 - b. Onsite representation requirements.
 - c. Use of an ASTM E 1745 vapor retarder installed following ASTM E 1643 and ASTM F710 guidelines; slabs on deck do not require a vapor retarder.

2. Manufacturer's Warranty: To include:
 - a. Term: Life of the concrete.
 - b. Repair and/or removal of failed flooring or roofing.
 - c. Placement of a topical moisture remediation system.
 - d. Replacement of flooring/roofing materials like original installed to include material and labor.
3. Adhesion Warranty: MVRA Manufacturer shall provide an adhesion warranty to match the term of the adhesive and/or primer manufacturer's material defect warranty upon MVRA manufacturer's acceptance of field bond test.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 1. ACI 301.
 2. ACI 117.

2.3 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

- C. Forms for Pedestals and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.4 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Plain-Steel Wire: ASTM A 82, as drawn.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.5 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.6 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
1. Portland Cement: ASTM C 150, Type I/II, gray Supplement with the following at contractor's option for concrete other than slabs and flatwork:
 - a. Fly Ash: ASTM C 618, Class C.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse-Aggregate Size: As indicated.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.7 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Moisture Vapor Reduction Admixture: For use in all interior slabs on ground and elevated floor slabs on metal deck.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Barrier One Incorporated; High Performance Concrete Admixture or comparable product by one of the following:
 - a. Concure Systems; High Performance Concrete Admixture.
 - b. ISE Logik Industries; MVRA 900 Admixture.
 - c. Moxie; Shield 1800 Admixture.
 - d. The Specialty Products Group; Vapor Lock 20/20.

2. Failure to provide a product that meets or exceeds the MVRA warranty requirements of Part 1 and the MVRA field quality control requirements of Part 3 will result in all subsequent testing and slab remediation costs being born by the ready mix supplier.
3. Description: Concrete moisture vapor reduction admixture for all interior slabs on ground and elevated floor slabs on metal deck shall be a non-toxic liquid admixture specifically designed to have a natural chemical reaction with pre-existing elements inside the concrete to eliminate the route of moisture vapor emission through the slab by restricting the integral capillary system. Chemical reaction shall form a permanent barrier (capillary break) that is integral to the concrete, insoluble, and irremovable.

2.8 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Colloid Environmental Technologies Company; Volclay Waterstop-RX.
 - b. Concrete Sealants Inc.; Conseal CS-231.
 - c. Greenstreak; Swellstop.
 - d. Henry Company, Sealants Division; Hydro-Flex.
 - e. JP Specialties, Inc.; Earthshield Type 20.
 - f. Progress Unlimited, Inc.; Superstop.
 - g. TCMiraDRI; Mirastop.

2.9 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fortifiber Corporation; Moistop Ultra, 15 mils.
 - b. Raven Industries Inc.; Vapor Block, 15 mils.
 - c. Stego Industries, LLC; Stego Wrap, 15 mils.
 - d. Insulation Solutions, Inc.: Viper Vaporcheck, 16 mils.
- B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve placed below the vapor retarder.
 1. Install and compact at 4 inches minimum depth, unless otherwise indicated on the Drawings.

2.10 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Axim Concrete Technologies; Cimfilm.
 - b. Burke by Edoco; BurkeFilm.
 - c. ChemMasters; Spray-Film.
 - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film.
 - f. Euclid Chemical Company (The); Eucobar.
 - g. Kaufman Products, Inc.; Vapor Aid.
 - h. Lambert Corporation; Lambco Skin.
 - i. L&M Construction Chemicals, Inc.; E-Con.
 - j. MBT Protection and Repair, Div. of ChemRex; Confilm.
 - k. Meadows, W. R., Inc.; Sealtight Evapre.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
 - n. Sika Corporation, Inc.; SikaFilm.
 - o. Spec Chem; Spec Film RTU
 - p. Symons Corporation, a Dayton Superior Company; Finishing Aid.
 - q. Unitex; Pro-Film.
 - r. US Mix Products Company; US Spec Monofilm ER.
 - s. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Spec Chem; Spec REZ
 - b. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
 - c. Burke by Edoco; Aqua Resin Cure.
 - d. ChemMasters; Safe-Cure Clear.
 - e. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
 - f. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
 - g. Euclid Chemical Company (The); Kurez DR VOX.
 - h. Kaufman Products, Inc.; Thinfilm 420.
 - i. Lambert Corporation; Aqua Kure-Clear.
 - j. L&M Construction Chemicals, Inc.; L&M Cure R.
 - k. Meadows, W. R., Inc.; 1100 Clear.
 - l. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
 - m. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
 - n. Tamms Industries, Inc.; Horncure WB 30.

- o. Unitex; Hydro Cure 309.
- p. US Mix Products Company; US Spec Maxcure Resin Clear.
- q. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.11 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.
- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Reglets: Fabricate reglets of not less than 0.0217-inch- (0.55-mm-) thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

2.12 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.13 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, according to ACI 301.
 - 1. Use a qualified independent 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: 15 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.3 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing, high-range water-reducing or plasticizing 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, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Proportion normal-weight concrete mixtures to equal or exceed the minimum 28 day concrete compressive strength and other specified criteria indicated on the drawings.
- B. Slabs-on-grade and elevated floor slabs-on-metal deck: Comply with Paragraph 2.16.A and as follows:
 - 1. Moisture Vapor Reduction Admixture: Dose at 14 ounces per 100 pounds of total cementitious materials. Remove an equal amount of water from the mix. Add separately from other admixtures at the tail end of the load.

2.15 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
 2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. 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.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - 1. Leave formwork for structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
 - 2. Seal around all penetrations with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 2. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete

when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) 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: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 and if specifically approved by the Architect..
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of

concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view such as mechanical rooms and storage rooms where cast-in-place concrete walls occur.

- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in 1 direction.
 1. Apply scratch finish to surfaces to receive concrete floor toppings.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces to receive trowel finish.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish all surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15; for slabs-on-grade with carpet.
 - b. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for slabs-on-grade with ceramic tile, sheet flooring, vinyl tile and other thin flooring materials, and at areas with no floor covering.
 - c. Specified overall values of flatness, F(F) 50; and of levelness, F(L) 40; with minimum local values of flatness, F(F) 40; and of levelness, F(L) 35; for gymnasiums.
 - d. Specified overall values of flatness, F(F) 25; with minimum local values of flatness, F(F) 20; for elevated slabs and toppings.
 - e. Specified overall values of flatness, F(F) 40, and levelness, F(L) 30; for slabs with polished concrete.

- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete 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. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
 - 1. Construct concrete bases 4 inches ((100 mm)) high unless otherwise indicated; and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Cure concrete surfaces to receive floor coverings with a moisture-retaining cover.
 - 2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner shall engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
 - 1. Steel reinforcement placement.
 - 2. Steel reinforcement welding.
 - 3. Headed bolts and studs.
 - 4. Verification of use of required design mixture.
 - 5. Concrete placement, including conveying and depositing.
 - 6. Curing procedures and maintenance of curing temperature.
 - 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - a. When frequency of testing will provide 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.
 - b. Either 6" diameter by 12" cylinders or 4" diameter by 8" cylinders are acceptable.
 - c. Cylinder diameter shall be at least three times the nominal maximum coarse aggregate size if the mix being tested.
 - d. All cylinders of a class of concrete shall be the same size.
 - 2. Slump: ASTM C 143/C 143M; 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. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method at point of placement, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 - 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. A set of test cylinders shall consist of a minimum of four standard cylinder specimens for each composite sample. The number per set may be greater depending on the cylinder sizes.
7. Compressive-Strength Tests: ASTM C 39/C 39M; test one cylinder of the laboratory-cured specimens at 7 days and one set of at least two cylinders at 28 days.
 - a. Test one cylinder of a set at 7 days and one set of two 6" by 12" cylinders or three 4" by 8" cylinders at 28 days.
 - b. One cylinder shall be retained in reserve to be tested as directed by the Engineer.
 - c. A compressive-strength test shall be the average compressive strength from a set of at least two cylinders obtained from the same composite sample and tested at age indicated.
8. 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 (3.4 MPa). Maintenance of test data records required for evaluation and acceptance of concrete strengths per ACI 318 shall be by the Contractor.
9. When the aforementioned acceptance criteria are not met the Contractor shall evaluate operations and steps shall be taken to increase the average of subsequent strength test results.
10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
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: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
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 does not comply with the Contract Documents.

D. Testing of Slabs Containing MVRA:

1. The moisture vapor reduction admixture (MVRA) manufacturer will perform all moisture testing in accordance with this specification and will issue project specific warranties prior to installation of any slab finishes; no further field slab moisture nor pH testing shall be required.
 - a. Failure to provide a product that meets or exceeds these requirements will result in all subsequent testing and slab remediation costs being borne by the contractor.
2. A representative or agent of the moisture vapor reduction admixture (MVRA) manufacturer must be present at the jobsite during placement of all MVRA treated concrete. Do not proceed without this representative being present.
3. Field testing technician shall, at the expense of the MVRA Manufacturer, procure at least one 4 inch (102 mm) cylinder from every day of placement of MVRA dosed concrete for the purpose of subsequent hydraulic conductivity/coefficient of permeability testing.
4. All cylinders shall be independently lab tested in accordance with ASTM D 5084 at the expense of the MVRA manufacturer.
5. Test results must conform to specified limits.
 - a. Should any cylinder from any day of placement deliver results in excess of 6.0×10^{-8} cm/sec, the concrete moisture vapor reduction admixture manufacturer shall procure, at their expense, a core (or cores) from that day of placement. This core (cores) shall be sent to an independent laboratory for hydraulic conductivity (coefficient or permeability) per ASTM D 5084.
 - b. Should any core deliver results in excess of 6.0×10^{-8} cm/sec per ASTM D 5084, the concrete moisture vapor reduction admixture manufacturer shall provide, at their expense, a topical moisture mitigation system for all areas not meeting the stated limit.
6. Proceeding with placement of concrete dosed with the MVRA without the required representation will result in the contractor bearing the cost to core and ship appropriate material for testing per ASTM D 5084.

END OF SECTION 033000

SECTION 033536 - POLISHED CONCRETE FLOOR FINISHING

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 products and procedures for placement, finishing, and polishing new cast-in-place concrete floors.
- B. Related Sections:
 - 1. Section 033000 "Cast-in-place Concrete" for concrete reinforcing and slabs poured on top of permanent form system.
 - 2. Section 079200 "Joint Sealants" for joints in concrete slabs.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's technical literature for each product indicated, specified, or required. Include manufacturer's technical data, application instructions, and recommendations.
- B. Samples for Initial Selections:
 - 1. Aggregates: Labeled, sealed plastic bags with one pound of each aggregate in concrete mix.
 - 2. Color Pigment Stain: Full range of available standard manufacturers samples of actual products showing colors.
- C. Samples for Verification: Submit 12-inch square samples of polished finish in each color, texture, and pattern specified; include not less than 3 in each sample set showing limits of variations expected for each color, texture, and pattern specified. Resubmit samples until approved.
- D. Field Quality Control Reports: Certification required by Field Quality Control article.
- E. Maintenance Data: For inclusion in operation and maintenance manual required by Division 01. Include manufacturer's instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use. Include precautions against cleaning products and methods which may be detrimental to polished finishes and performance.

1.4 QUALITY ASSURANCE

- A. Single-source Responsibility: Manufacturer of concrete products and applied materials shall be manufactured by a single manufacturer. However, the product manufacturer does not need to be the installer or polisher as long as they meet the requirements specified herein.
- B. Concrete Producer Qualifications: Firm experienced in manufacturing ready-mixed concrete products and that complies with following requirements for production facilities and equipment:
1. ASTM C 94.
 2. NRMCA's Certification of Ready Mixed Concrete Production Facilities.
 3. Polisher Qualifications:
 - a. Experience: Company with not less than 5 years' experience in performing specified work similar in design, products, and extent to scope of this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce required Work.
 - b. On-site staff is certified by manufacturer of polishing equipment.
 - c. Trade Association: Member in good standing of CPAA.
 4. Walkway Auditor: Person certified by NFSI trained to test polished surfaces for static coefficient of friction according to ANSI B101.3-2012.
 5. Static Coefficient of Friction: Products and polishing operations shall achieve following as determined by quality control testing according to ANSI B101.3-2012:
 - a. Floor Surfaces: High traction.
 6. Field Mock-up for Aesthetic Purposes: Before performing work of this Section, provide as many field samples as required to verify selections made under submittals and to demonstrate aesthetic effects of polished finish. Approval does not constitute approval of deviations from Contract Documents, unless such deviations are specifically approved by Architect in writing.
 - a. Polish 20 foot by 20-foot floor area for each polished finish type.
 - b. Use same personnel, including supervisors, which will perform work.
 - c. Install products and materials according to specified requirements.
 - d. Work shall be representative of those to be expected for work.
 - e. Show maximum variation that will exist in work.
 - f. Approval is for following aesthetic qualities:
 - 1) Compliance with approved submittals.
 - 2) Uniformity of exposed aggregate.
 - 3) Uniformity of sheen.
 - g. Obtain Architect's approval before starting work on Project.
 - h. Protect approved field mock-ups from elements with weather resistant covering.
 - i. Maintain field mock-ups during construction in an undisturbed condition as a standard for comparing completed Work.
 - j. Do not demolish, alter, or remove field mock-ups until acceptable to Owner and Architect.
 - k. When directed, demolish and remove field mock-ups from Project.

7. Pre-Installation Conference: Prior to placing concrete for areas scheduled for polished concrete floor finish, and after mockup is in place, conduct conference at Project to comply with requirements of applicable Division 01 Sections.
 - a. Required Attendees:
 - 1) Owner.
 - 2) Architect.
 - 3) Contractor, including supervisor.
 - 4) Polisher, including supervisor.
 - 5) Concrete producer.
 - 6) Concrete finisher, including supervisor.
 - b. Minimum Agenda: Polisher shall demonstrate understanding of work required by reviewing and discussing procedures for, but not limited to, following:
 - 1) Tour mock-up and representative areas of required work, discuss and evaluate for compliance with Contract Documents, including substrate conditions, surface preparations, sequence of installation and other preparatory Work performed by other installers.
 - 2) Review Contract Document requirements.
 - 3) Review approved submittals.
 - 4) Review installation procedures, including, but not limited to:
 - a) Concrete placement, finishing, and preparation for polished finish.
 - b) Concrete curing.
 - c) Application of polishing products.
 - d) Grinding and polishing operations.
 - c. Reports: Record discussions, including decisions and agreements reached, and furnish copy of record to each party attending.

1.5 PROJECT CONDITIONS

- A. Damage and Stain Prevention: Damage and staining of concrete surfaces to be polished shall be avoided by all possible means.
 1. Prohibit following over concrete surfaces to be polished:
 - a. Vehicle parking.
 - b. Pipe cutting operations.
 - c. Ferrous metals storage.
 - d. Methods for moisture retention or surface protection during slab curing shall be reviewed with Architect in advance.
 - e. Protect concrete surfaces to be polished from following:
 - 1) Petroleum, oil, hydraulic fluid, or other liquid dripping from equipment.
 - 2) Acids and acidic detergents.
 - 3) Painting activities.
 - 4) Storage of materials, including pallets with ferrous nails.

2. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential.
 - a. All hydraulic powered equipment must be diapered to avoid staining of the concrete.
 - b. No trade will park vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.
 - c. No pipe cutting machine will be used on the inside floor slab.
 - d. Steel will not be placed on interior slab to avoid rust staining.
3. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting polishing operations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Products: Subject to compliance with requirements, provide products by one of the following:
 1. Bomanite.
 2. Prosoco, Inc.
 3. Ameripolish.

2.2 CURING MATERIALS

- A. Absorptive Cover: Wet cure using one of the methods below:
 1. AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd.
 2. Ultra cure by McTech Group.

2.3 APPLIED PRODUCTS

- A. Colorant:
 1. Description: Water based.
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Ameripolish; SureLock Dye.
 - b. Prosoco; Consolideck GemTone
- B. Reactive Densifier:
 1. Description: Chemical densifier specifically for concrete surface treatment which reacts chemically to the concrete surface forming a clear, dense, durable, hard, abrasion-

resistant surface. Product shall be a colorless, odorless, water-based solution that is less than 50 VOC.

a. Products: Subject to compliance with requirements, provide one of the following:

- 1) Ameripolish; 3D Densifier.
- 2) Convergent Concrete Technologies; Pentra-Sil (NL).
- 3) Prosoco; Blended Densifier.

C. Patching Compound:

1. Description: Compound composed of 40 percent portland cement, 45 percent limestone, and 15 percent vinyl acetate copolymer, when mixed with dust salvaged from grinding process forms a paste that hardens when surface imperfections are filled.

a. Basis of Design Product: Subject to compliance with requirements, provide HT; Spall-FX or equal product by one of the approved manufacturers.

D. Grout Material:

1. Description: Clear modified silicate sealant, containing no pore clogging latex, when mixed with dust salvaged from grinding process forms a paste that reacts with calcium hydroxide in concrete that hardens when surface imperfections are filled.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Prosoco; Grind-N-Fill or equal product by one of the approved manufacturers.

E. Joint Filler:

1. Description: Moisture insensitive, self-leveling, non-staining, two component, 100% solids polyuria elastomer joint filler with exceptional UV resistance.

2. Basis-of-Design Product: Subject to compliance with requirements, provide HT-PE; 85 ml.

F. Penetrating Surface Treatment/Stain Guard:

1. Description: Penetrating Concrete stain protector specifically for concrete surface treatment which reacts chemically to the concrete surface maintaining a clear, dense, durable, hard, abrasion- resistant surface. Product shall be a solution that is less than 10 g/L VOC.

a. Provide one of the following products:

- 1) American Decorative Concrete; SR2 Stain Protector.
- 2) Prosoco; Consolideck Concrete Protector.

G. Protective Cover:

1. Description: Non-woven, puncture and tear resistant, polypropylene fibers laminated with a multi-ply, textured membrane, not less than 18 mils in thickness.

2. Basis of Design Product: Subject to compliance with requirements, provide American Concrete Technologies, Inc.; CreteClad or equal product by one of the approved manufacturers.

2.4 POLISHING EQUIPMENT

A. Field Grinding and Polishing Equipment:

1. Variable speed, 3 or 4 head counter-rotating, walk-behind machine with not less than 600 lbs of down pressure on grinding or polishing pads.
2. Dust extraction equipment with flow rate suitable for dust generated, with pre-separator and squeegee attachments.
3. Edge Grinding and Polishing Equipment: Hand-held or single head walk-behind machines which produces same results, without noticeable differences, as field grinding and polishing equipment.
4. Burnishing Equipment: Single head high speed walk-behind machines.
5. Grinding Pads: Metal bonded pads with embedded industrial grade diamonds of varying grits fabricated for mounting on equipment.
6. Polishing Pads: Resin bonded pads with embedded industrial grade diamonds of varying grits fabricated for mounting on equipment.
7. Burnishing Pads: Maintenance pads coated with embedded industrial grade diamonds for use with burnishing equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Acceptance of Surfaces and Conditions: Examine substrates to be polished for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

- A. Cleaning New Concrete Surfaces: Prepare and clean concrete surfaces. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, paint splatter, and other contaminants incompatible with polished concrete floor finish.

3.3 CONCRETE POLISHING

- A. Ensure surfaces are clean (free of oil, grease, dirt, dust, contaminants, etc.) and dry.
- B. Complete all joint replacement and slab repair work minimum 12 hours prior to commencement of any polishing.

- C. Allow new concrete slab to achieve its 28-day design strength as documented by CTL. Approved compressive strength test report from Construction Testing Laboratory must be received by AOR prior to allowing color densification.
- D. Include all work necessary to achieve specified Finish Requirements.
- E. Sequential progression of diamond pads shall be required and limited to no more than double the grit value of the previous diamonds used.
- F. Progressively diamond polish edges along and around all abutments. Use same progression of polishing segments throughout.
- G. Between and after final wet polishing passes, thoroughly scrub and rinse slab surface with clean water and vacuum with auto-scrubber.
- H. Initial Grinding:
 - 1. Use grinding equipment and low grit grinding pads.
 - 2. Grind concrete to specified aggregate exposure imparting uniform scratch pattern in concrete.
 - 3. Vacuum floor using squeegee vacuum attachment.
 - 4. Level of Grinding:
 - a. Description: Fine aggregate intentionally exposed to create a salt and pepper appearance matching approved mock-up.
- I. Sealing, Hardening and Polishing of Concrete Surface.
 - 1. Concrete must be in place a minimum of 28 days or as directed by the manufacturer before application can begin.
 - 2. Grind floor to desired aggregate exposure- class B “fine aggregate salt and pepper” as defined by CPAA.
 - 3. Apply penetrating dye/ stain if applicable.
 - 4. Apply hardening / sealing compound.
 - 5. Polish to sheen level of minimum 45.
 - 6. Apply penetrating surface treatment / stain guard.
 - 7. Burnish.
- J. Treating Surface Imperfections:
 - 1. Mix patching compound and grout material with dust created by grinding operations to match color of adjacent concrete surface.
 - 2. Fill surface imperfections including, but not limited to, holes, surface damage, small and micro cracks, air holes, pop-outs, and voids.
 - 3. Work compound and treatment until color differences between concrete surface and filled surface imperfections are not noticeable.
- K. Applying Liquid Densifier: Apply undiluted to point of rejection, remove excess liquid, and allow to cure. Apply prior to grinding at level 400.

- L. Applying Dyes and Colorants: Uniformly apply at appropriate time to match approved mock-up.
- M. Grout Grinding:
 - 1. Perform prior to any application of dying.
 - 2. Use grinding equipment and appropriate grit grinding pads.
 - 3. While applying fresh grout material prior to, grind concrete in direction perpendicular to initial grinding to remove scratches.
 - 4. Vacuum floor using squeegee vacuum attachment.
- N. Additional Grinding:
 - 1. Use grinding equipment and increasing finer grit grinding pads.
 - 2. Grind concrete in as many passes necessary with each pass perpendicular to previous pass to remove scratches.
 - 3. Vacuum floor using squeegee vacuum attachment.
- O. Polishing:
 - 1. Use polishing equipment and increasing finer grit polishing pads.
 - 2. Polish concrete in as many passes necessary with each pass perpendicular to previous pass to remove scratches.
 - 3. Vacuum floor using squeegee vacuum attachment.
- P. Applying penetrating stain protectant: Uniformly apply and remove excessive liquid.
- Q. Final Polished Sheen: Provide between 35-50 to match mock-ups and as approved by Architect and verified with ASTM D1455.

3.4 FIELD QUALITY CONTROL

- A. Static Coefficient of Friction Testing: Retain Walkway Auditor to test polished finishes according to NFSI 101-A to confirm compliance with specified static coefficient of friction.

3.5 PROTECTION

- A. Covering: Protect polished finish work from subsequent construction with protective covering.

END OF SECTION 033536

SECTION 034100 - PRECAST STRUCTURAL 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. Precast double tees.
- 2. Thin-brick faced, precast structural concrete wall panels.

- B. Related Requirements:

- 1. Section 033000 "Cast-in-Place Concrete" for concrete topping and placing connection anchors in concrete.
- 2. Section 042000 "Unit Masonry" for mortar joint color and shape.
- 3. Section 051200 "Structural Steel Framing" for furnishing and installing connections attached to structural-steel framing.
- 4. Section 055000 "Metal Fabrications" for kickers and other miscellaneous steel shapes.

1.3 DEFINITIONS

- A. Design Reference Sample: Sample of approved precast structural concrete color, finish, and texture, preapproved by Architect.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each precast concrete mixture. Include compressive strength and, if required, water-absorption tests.

- C. Shop Drawings: Signed and sealed by the engineer licensed in the state to which the project is located and responsible for their preparation. Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement. Detail fabrication and installation of precast structural concrete units.
1. Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement.
 2. Detail fabrication and installation of precast structural concrete units, including connections at member ends and to adjoining construction.
 3. Indicate joints, reveals, and extent and location of each surface finish.
 4. Indicate separate face and backup mixture locations and thicknesses.
 5. Indicate welded connections by AWS standard symbols. Show size, length, and type of each weld.
 6. Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.
 7. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
 8. Include and locate openings larger than by 10 inches (250 mm).
 9. Indicate location of each precast structural concrete unit by same identification mark placed on panel.
 10. Indicate relationship of precast structural concrete units to adjacent materials.
 11. Indicate locations, dimensions and details of thin-brick units, including corner units and special shapes, and joint treatments.
 12. Indicate shim sizes and grouting sequence.
 13. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.
- D. Samples:
1. For each type of finish indicated on exposed surfaces of precast structural concrete units with architectural finish, in sets of three, representative of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches (300 by 300 by 50 mm).
 - a. Where other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.
 2. Samples for each thin-brick unit required, showing full range of color and texture expected. Include Samples showing color and texture of joint treatment.
 - a. Grout Samples for Initial Selection: Color charts consisting of actual sections of grout showing manufacturer's full range of colors.
 - b. Grout Samples for Verification: Showing color and texture of joint treatment.
- E. Delegated-Design Submittal: For precast structural concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in the state to which the project is located and responsible for their preparation.

1. Show precast structural concrete unit types, connections, types of reinforcement, including special reinforcement, and concrete cover on reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frames and foundations from precast structural concrete.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.
- B. Welding certificates.
- C. Material Certificates: For the following:
 1. Cementitious materials.
 2. Reinforcing materials and prestressing tendons.
 3. Admixtures.
 4. Bearing pads.
 5. Structural-steel shapes and hollow structural sections.
 6. Thin-brick units and accessories.
 7. Insulation.
- D. Material Test Reports: For aggregates, by a qualified testing agency.
- E. Preconstruction test reports.
- F. Source quality-control reports.
- G. Field quality-control and special inspection reports.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 1. Designated as a PCI-certified plant as follows:
 - a. Group C, Category C3 - Prestressed Straight Strand Structural Members.
 - b. Group CA, Category C3A - Prestressed Straight-Strand Structural Members.
 - c. Group C, Category C4 – Prestressed Deflected-Strand Structural Members.
 - d. Group C, Category C1 – Precast Concrete Products (No Pre-Stressed Reinforcing)
- B. Installer Qualifications: A precast concrete erector qualified and designated by PCI's Certificate of Compliance, to erect Category S2 - Complex Structural Systems.
- C. Installer Qualifications: An experienced precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project installed by erector in Category S2 - Complex Structural Systems and who can produce an Erectors' Post Audit Declaration, according to PCI MNL 127, "PCI Erector's Manual - Standards and Guidelines for the Erection of Precast Concrete Products."

- D. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- E. Quality-Control Standard: For manufacturing procedures, testing requirements, and quality-control recommendations for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."
- F. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."
- G. Sample Panels: After sample approval and before fabricating precast structural concrete units with thin-brick facing, produce a minimum of three sample panels approximately 16 sq. ft. in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.
 - 1. Locate panels as directed by the Construction Manager.
 - 2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
 - 3. After approval of repair technique, maintain one sample panel at fabricator's plant and two at Project site in an undisturbed condition as a standard for judging the completed Work.
 - 4. Demolish and remove sample panels when directed by the Construction Manager.

1.8 COORDINATION

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction before starting that Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Support units during shipment on nonstaining shock-absorbing material in same position as during storage.
- B. Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
 - 1. Store units with dunnage across full width of each bearing point unless otherwise indicated.
 - 2. Place adequate dunnage of even thickness between each unit.
 - 3. Place stored units so identification marks are clearly visible, and units can be inspected.
- C. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.
- D. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 FABRICATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Concrete Industries, Inc.
 2. Coreslab Structures (Missouri) Inc.
 3. Cretex.
 4. Enterprise Precast Concrete Inc.
 5. Fabcon.
 6. Prestressed Casting Company.
 7. TDI Tulsa Dynaspan, Inc.
 8. Molin Concrete Products Company.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design precast structural concrete, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design Standards: Comply with ACI 318 and with design recommendations in PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.
- C. Structural Performance: Precast structural concrete units and connections shall withstand design loads indicated within limits and under conditions indicated.
1. Design precast structural concrete framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements. Maintain precast structural concrete deflections within limits of ACI 318.
 - a. Thermal Movements: Allow for in-plane thermal movements resulting from annual ambient temperature changes of 80 deg F (26 deg C).

2.3 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.
1. Mold-Release Agent: Commercially produced form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

2.4 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60 (Grade 420), deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497 or ASTM A 1064, flat sheet.
- E. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

2.5 PRESTRESSING TENDONS

- A. Pretensioning Strand: ASTM A 416, Grade 270, uncoated, seven-wire, low-relaxation strand.
- B. Post-Tensioning Bars: ASTM A 722, uncoated high-strength steel bar.

2.6 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.
 - 1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.
- B. Supplementary Cementitious Materials:
 - 1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
 - 2. Metakaolin: ASTM C 618, Class N.
 - 3. Silica Fume: ASTM C 1240, with optional chemical and physical requirement.
 - 4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- C. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse aggregates complying with Class 4S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
 - 1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
 - a. Gradation: To match design reference sample.
 - 2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate to match approved finish sample.
- D. Lightweight Aggregates: Except as modified by PCI MNL 117, ASTM C330/C330M, with absorption less than 11 percent.

- E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.
- F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.
 - 1. Water-Reducing Admixtures: ASTM C 494, Type A.
 - 2. Retarding Admixture: ASTM C 494, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 - 4. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
 - 5. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 - 6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
 - 7. Plasticizing Admixture: ASTM C 1017, Type I.
 - 8. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

2.7 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A 36.
- B. Carbon-Steel-Headed Studs: ASTM A 108, Grade 1010 through 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 116.
- C. Carbon-Steel Plate: ASTM A 283, Grade C.
- D. Malleable-Iron Castings: ASTM A 47, Grade 32510 or Grade 35028.
- E. Carbon-Steel Castings: ASTM A 27, Grade 60-30 (Grade 415-205).
- F. High-Strength, Low-Alloy Structural Steel: ASTM A 572.
- G. Carbon-Steel Structural Tubing: ASTM A 500, Grade B or Grade C.
- H. Wrought Carbon-Steel Bars: ASTM A 675, Grade 65.
- I. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706.
- J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563 (ASTM A 563M); and flat, unhardened steel washers, ASTM F 844.
- K. High-Strength Bolts and Nuts: ASTM A 325 or ASTM A 490 Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563; and hardened carbon-steel washers, ASTM F 436.
 - 1. Do not zinc coat ASTM A 490 bolts.

- L. Zinc-Coated Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123 or ASTM A 153.
 - 1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.
 - 2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight and complying with DOD-P-21035B or SSPC-Paint 20.
- M. Welding Electrodes: Comply with AWS standards.
- N. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install precast structural concrete units.

2.8 BEARING PADS

- A. Provide one of the following bearing pads for precast structural concrete units as recommended by precast fabricator for application:
 - 1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore, Type A durometer hardness, ASTM D 2240; minimum tensile strength 2250 psi (15.5 MPa), ASTM D 412.
 - 2. Random-Oriented-Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. 70 to 90 Shore, Type A durometer hardness, ASTM D 2240; capable of supporting a compressive stress of 3000 psi (20.7 MPa) with no cracking, splitting, or delaminating in the internal portions of pad. Test one specimen for every 200 pads used in Project.
 - 3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer; 80 to 100 Shore, Type A durometer hardness, ASTM D 2240; complying with AASHTO's "AASHTO LRFD Bridge Design Specifications," Division II, Section 18.10.2; or with MIL-C-882E.
 - 4. Frictionless Pads: PTFE, glass-fiber reinforced, bonded to stainless- or mild-steel plate, or random-oriented-fiber-reinforced elastomeric pads; of type required for in-service stress.
 - 5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.9 ACCESSORIES

- A. Precast Accessories: Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install structural precast concrete units.

2.10 GROUT MATERIALS

- A. Nonmetallic, Nonshrink Grout: Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B

and C for flowable grout and of consistency suitable for application within a 30-minute working time. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218.

2.11 THIN BRICK AND ACCESSORIES

A. Products: Subject to compliance with requirements, provide the following:

1. FB-1: Belden Brick; Soapstone Velour.
 - a. Face Size (Actual Dimension): 2-1/4 inches high by 7-5/8 inches long.
2. Fabricator shall coordinate with masonry contractor to single source the manufacturer of the thin brick product with the face brick product so that there is only one type of brick from the same manufacturer.

B. Thin Brick: Not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) thick, and as follows:

1. Dimensional Tolerances: Plus 0 inch (0 mm) or minus 1/16 inch (1.6 mm) for any dimension 8 inches (203 mm) or less and plus 0 inch (0 mm) or minus 3/32 inch (2.4 mm) for any dimension more than 8 inches (203 mm).
2. Out-of-Square Tolerance: Plus or minus 1/16 inch (1.6 mm).
3. Warpage Tolerance: Plus 0 inch (0 mm) or minus 1/16 inch (1.6 mm).
4. Variation of Shape from Specified Angle: Plus or minus one degree.
5. Modulus of Rupture: Not less than 250 psi (1.7 MPa) when tested according to ASTM C 67.
6. Tensile Bond Strength: Not less than 150 psi (1.0 MPa) when tested before and after freeze-thaw test according to ASTM E 488 as modified: Adhere a steel plate with a welded rod on a single thin-brick face with epoxy for each test.
7. 24-Hour Cold-Water Absorption: Not more than 6 percent when tested according to ASTM C 67.
8. Freeze-Thaw Resistance: No detectable disintegration or separation after 300 freezing-and-thawing cycles when tested according to ASTM C 666/C 666M, Method B.
9. Chemical Resistance: Tested according to ASTM C 650 and rated "not affected."
10. Efflorescence: Tested according to ASTM C 67 and rated "not effloresced."
11. Surface Coating: Thin brick with colors or textures applied as coatings shall withstand 50 cycles of freezing and thawing; ASTM C 67 with no observable difference in applied finish when viewed from 10 feet (3 m).
12. Back Surface Texture: Scored, combed, wire roughened, ribbed, keybacked, or dovetailed.

C. Special Shapes: Include corners, edge corners, and end edge corners.

D. Pointing Grout: Packaged, polymer-modified, sanded grout complying with ANSI A118.7.

1. Polymer Type: Acrylic resin in dry, redispersible form, packaged with other dry ingredients or liquid-latex form for adding packaged dry-grout mix.
2. Colors: Match mortar used in Section 04200 "Unit Masonry".

2.12 INSULATED PANEL ACCESSORIES

- A. Extruded-Polystyrene (XPS) Board Insulation: ASTM C 578, Type IV, 1.55 lb/cu. ft. (25 kg/cu. m); square or ship-lap edges; with thickness as indicated in drawings.
- B. Wythe Connectors: manufacturer's standard fiber composite connectors to connect wythes of precast concrete panels.

2.13 CONCRETE MIXTURES

- A. Prepare design mixtures for each type of precast concrete required.
 - 1. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
 - 2. Limit use of fly ash to 25 percent replacement of portland cement by weight and ground granulated blast-furnace slag to 40 percent of portland cement by weight; metakaolin and silica fume to 10 percent of portland cement by weight.
- B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.
- C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 (ACI 318M) or PCI MNL 116 when tested according to ASTM C 1218/C 1218M.
- D. Normal-Weight Concrete Mixtures: Proportion full-depth mixture by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 5000 psi (34.5 MPa).
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
- E. Lightweight Concrete Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 5000 psi (34.5 MPa).
 - 2. Unit Weight: Calculated equilibrium unit weight of 118 lb/cu. ft. (1910 kg/cu. m), plus or minus 4 lb/cu. ft. (65 kg/cu. m), according to ASTM C567.
 - 3. Lightweight concrete is only allowed for precast double tee members where required by the precast structural concrete fabricator due to the member length **and** when approved by the engineer.
- F. Water Absorption: For structural precast concrete with an architectural finish, limit water absorption to 6 percent by weight or 14 percent by volume, tested according to ASTM C 642, except for boiling requirement.
- G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.

- H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.
- I. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.14 MOLD FABRICATION

- A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.
- B. Maintain molds to provide completed precast structural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
 - 1. Edge and Corner Treatment: Uniformly chamfered.

2.15 THIN-BRICK FACINGS

- A. Place form liner templates accurately to provide grid for thin-brick facings. Provide solid backing and supports to maintain stability of liners while placing thin bricks and during concrete placement.
- B. Securely place thin-brick units face down into form liner pockets and place concrete backing mixture.
- C. Completely fill joint cavities between thin-brick units with sand-cement mortar, and place precast concrete backing mixture while sand-cement mortar is still fluid enough to ensure bond.
 - 1. Mortar color shall match the mortar color in the masonry cavity wall construction. Coordinate with the masonry contractor and refer to Section 04200 "Unit Masonry" for color.
- D. Mix and install pointing grout according to ANSI A108.10. Completely fill joint cavities between thin-brick units with pointing grout and compress into place without spreading grout onto faces of thin-brick units. Remove excess grout immediately to prevent staining of thin brick.
 - 1. Tool joints to a slightly concave shape when pointing grout is thumbprint hard. Coordinate with the masonry contractor so that joint patterns in the thin-brick precast panels matches the joint patterns in the masonry cavity wall construction. Refer to Section 042000 "Unit Masonry".
- E. Clean faces and joints of thin-brick facing.

2.16 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
 - 1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."
- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast structural concrete units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in precast structural concrete units as indicated on the Contract Drawings.
- D. Cast-in openings larger than 10 inches (250 mm) in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.
- E. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.
 - 1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcement exceeds limits specified in ASTM A 775/A 775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
 - 2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
 - 3. Place reinforcing steel and prestressing strand to maintain at least 3/4-inch (19-mm) minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches (38 mm) when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
 - 4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
- F. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses and specified in-place loads.
- G. Prestress tendons for precast structural concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 116.
 - 1. Delay detensioning or post-tensioning of precast, prestressed structural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete unit.

2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
 3. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
 4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.
 5. Protect strand ends and anchorages with a minimum of 1-inch- (25-mm-) thick, nonmetallic, nonshrink, grout mortar and sack rub surface. Coat or spray the inside surfaces of pocket with bonding agent before installing grout.
- H. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- I. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch (25 mm) or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.
- J. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.
1. Place backup concrete mixture to ensure bond with face-mixture concrete.
- K. Thoroughly consolidate placed concrete by vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 116.
1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants." Ensure adequate bond between face and backup concrete, if used.
- L. Comply with PCI MNL 116 procedures for hot- and cold-weather concrete placement.
- M. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that does not show in finished structure.
- N. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.
- O. Discard and replace precast structural concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 116 and meet Architect's approval.
- 2.17 CASTING INSULATED WALL PANELS
- A. Cast, screed, and consolidate wythe supported by mold.

- B. Place insulation boards abutting edges and ends of adjacent boards. Insert wythe connectors through insulation and consolidate concrete around connectors according to connector manufacturer's written instructions.
- C. Ensure bottom wythe and insulation layer are not disturbed after bottom wythe reaches initial set.
- D. Cast, screed, and consolidate top wythe to meet required finish.
- E. Maintain temperature below 150 deg F (65 deg C) in bottom concrete wythe.

2.18 FABRICATION TOLERANCES

- A. Fabricate precast structural concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 116 product dimension tolerances as well as position tolerances for cast-in items.
- B. Thin-Brick-Faced Precast Structural Concrete Units: Restrict the following misalignments to 2 percent of number of thin bricks in a unit:
 - 1. Alignment of Mortar Joints:
 - a. Jog in Alignment: 1/8 inch (3 mm).
 - b. Alignment with Panel Centerline: Plus or minus 1/8 inch (3 mm).
 - 2. Variation in Width of Exposed Mortar Joints: Plus or minus 1/8 inch (3 mm).
 - 3. Tipping of Individual Thin Bricks from the Panel Plane of Exposed Thin-Brick Surface: Plus 0 inch (0 mm); minus 1/4 inch (6 mm) less than or equal to depth of form-liner joint.
 - 4. Exposed Thin-Brick Surface Parallel to Primary Control Surface of Panel: Plus 1/4 inch (6 mm); minus 1/8 inch (3 mm).
 - 5. Individual Thin-Brick Step in Face from Panel Plane of Exposed Thin-Brick Surface: Plus 0 inch (0 mm); minus 1/4 inch (6 mm) less than or equal to depth of form-liner joint.

2.19 COMMERCIAL FINISHES

- A. Commercial Grade: At interior face of wall panels, remove fins and protrusions larger than 1/8-inch (3 mm) and fill holes larger than 1/2-inch (13 mm). Rub or grind ragged edges. Faces must have true, well-defined surfaces. Air holes, water marks and color variations are permitted. Limit form joint offsets to 3/16-inch (5 mm).
- B. Smooth, steel trowel finish, unformed surfaces. Consolidate concrete, bring to proper level with straight edge, float and trowel to a smooth, uniform finish.

2.20 COMMERCIAL ARCHITECTURAL FINISHES

- A. Manufacture members faces free of joint marks, grain, and other obvious defects with corners, including false joints, uniform and straight. Finish exposed-face surfaces of precast concrete units to match approved sample panels and as follows:

1. As-Cast-Surface Finish: Provide surfaces to match approved sample or mockup for acceptable surface, air voids, sand streaks and honeycomb. Provide as-cast-surface finish at exterior side-faces not receiving thin-brick facing.
2. Thin-Brick Facing: See "Thin-Brick Facings" Article.

2.21 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods.
 1. Allow testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.
- B. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements and ASTM C 1610/C 1610M, ASTM C 1611/C 1611M, ASTM C 1621/C 1621M, and ASTM C 1712/C 1712M.
 1. Test and inspect self-consolidating concrete according to PCI TR-6.
- C. Strength of precast structural concrete units is considered deficient if units fail to comply with ACI 318 (ACI 318M) requirements for concrete strength.
- D. If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 (ACI 318M) requirements, employ a qualified testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M.
 1. A minimum of three representative cores shall be taken from units of suspect strength, from locations directed by Architect.
 2. Test cores in an air-dry condition or, if units are wet under service conditions, test cores after immersion in water in a wet condition.
 3. Strength of concrete for each series of three cores is considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
 4. Report test results in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports include the following:
 - a. Project identification name and number.
 - b. Date when tests were performed.
 - c. Name of precast concrete fabricator.
 - d. Name of concrete testing agency.
 - e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

- E. Patching: If core test results are satisfactory and precast structural concrete units comply with requirements, clean and dampen core holes and solidly fill with same precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
- F. Defective Units: Discard and replace precast structural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Do not install precast concrete units until supporting, cast-in-place concrete has attained minimum allowable design compressive strength and until supporting steel or other structure is structurally ready to receive loads from precast concrete units.

3.2 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting precast structural concrete units to supporting members and backup materials.
- B. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, shoring, and bracing as required to maintain position, stability, and alignment of units until permanent connections are complete.
 - 1. Install temporary steel or plastic spacing shims or bearing pads as precast structural concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
 - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 - 3. Remove projecting lifting devices and use plastic patch caps or sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
 - 4. For hollow-core slab voids used as electrical raceways or mechanical ducts, align voids between units and tape butt joint at end of slabs.
- C. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

1. Do not permit connections to disrupt continuity of roof flashing.
 - D. Field cutting of precast units is not permitted without approval of Architect.
 - E. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units.
 - F. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
 1. Protect precast structural concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
 2. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- (0.1-mm-) thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780/A 780M.
 3. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.
 4. Visually inspect welds and remove, reweld, or repair incomplete and defective welds.
 - G. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
 1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
 - H. Grouting or Dry-Packing Connections and Joints: Grout connections and joints and open spaces at keyways, connections, and joints where required or indicated on Shop Drawings. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled.
 1. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces.
 2. Fill joints completely without seepage to other surfaces.
 3. Trowel top of grout joints on roofs smooth and uniform. Finish transitions between different surface levels not steeper than 1 to 12.
 4. Place grout end cap or dam in voids at ends of hollow-core slabs.
 5. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.
 6. Keep grouted joints damp for not less than 24 hours after initial set.
- 3.3 ERECTION TOLERANCES
- A. Erect precast structural concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.
 - B. Minimize variations between adjacent slab members by jacking, loading, or other method recommended by fabricator and approved by Architect.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Erection of precast structural concrete members.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Visually inspect field welds and test according to ASTM E 165 or to ASTM E 709 and ASTM E 1444. High-strength bolted connections are subject to inspections.
- D. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.
- G. Prepare test and inspection reports.

3.5 REPAIRS

- A. Repair precast structural concrete units if permitted by Architect.
 - 1. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units have not been impaired.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet (6 m).
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780/A 780M.
- D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- E. Remove and replace damaged precast structural concrete units that cannot be repaired or when repairs do not comply with requirements as determined by Architect.

3.6 CLEANING

- A. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
- B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034100

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Face Brick.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.
9. Cavity-wall insulation.

- B. Related Sections include the following:

1. Section 047200 "Cast Stone Masonry" for cast stone window sills.
2. Section 072726 "Fluid-Applied Membrane Air Barriers" for air barrier membranes applied to cavity face of backup wythes of cavity walls.
3. Section 076200 "Sheet Metal Flashing and Trim" for sheet metal flashing.
4. Section 079200 "Joint Sealants" for sealing control and expansion joints in unit masonry.

- C. Products installed, but not furnished, under this Section include the following:

1. Steel lintels for unit masonry, furnished under Section 051200 "Structural Steel Framing."

1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths (f_m) at 28 days.

- B. Determine net-area compressive strength (f'_m) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
 - 1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
 - 2. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
 - 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.
 - 2. Weep holes/vents.
- D. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 - 1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- E. Qualification Data: For testing agency.
- F. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.

- a. Include a sealant-filled joint at least 16 inches (400 mm) long in exterior wall mockup.
 - b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches (300 mm) wide by 16 inches (400 mm) high.
 - c. Include through-wall flashing installed for a 24-inch (600-mm) length in corner of exterior wall mockup approximately 16 inches (400 mm) down from top of mockup, with a 12-inch (300-mm) length of flashing left exposed to view (omit masonry above half of flashing).
 - d. Include metal studs, sheathing, veneer anchors, flashing, and weep holes in exterior masonry-veneer wall mockup.
2. Clean 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 such deviations are specifically approved by Architect in writing.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Sections.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.
 2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Products: Subject to compliance with requirements, provide one of the products specified.

2. Manufacturers: Subject to compliance with requirements, provide one of the manufacturers specified.

2.2 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.3 CONCRETE MASONRY UNITS (CMUs)

- A. Shapes: Provide shapes indicated and as follows:
 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 2. Provide bullnose units for outside corners, unless otherwise indicated.
- B. Concrete Masonry Units (CMU): ASTM C 90.
 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2,800 psi (13.1 MPa).
 2. Weight Classification: Lightweight.
 3. Size (Width): Manufactured to the following dimensions:
 - a. 4 inch (100 mm) nominal: 3-5/8 inch (92 mm) actual.
 - b. 6 inch (150 mm) nominal: 5-5/8 inch (143 mm) actual.
 - c. 8 inch (200 mm) nominal: 7-5/8 inch (194 mm) actual.
 4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.4 MASONRY LINTELS

- A. General: Provide the following:
- B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 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. Face Brick: Facing brick complying with ASTM C 216.

1. FB-1:

a. Products: Subject to compliance with requirements, provide the following:

- 1) Belden Brick; Soapstone Velour

2. FB-2:

a. Products: Subject to compliance with requirements, provide one of the following:

- 1) Endicott; Red Blend Velour.
- 2) Acme Brick; Village

3. Size (Actual Dimension): 2-1/4 inches high by 3-5/8 inches wide by 7-5/8 inches long.
4. Grade: SW.
5. Type: FBS.
6. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi (23.10 MPa).
7. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67.
8. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
9. Size: Bricks manufactured to the following actual dimensions within tolerances specified in ASTM C 216:

2.6 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.
- D. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
- E. Aggregate for Grout: ASTM C 404.
- F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the following:
 - a. Addiment Incorporated; Mortar Kick.
 - b. Euclid Chemical Company (The); Accelguard 80.
 - c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
 - d. Sonneborn, Div. of ChemRex; Trimix-NCA.
- G. Water: Potable.

2.7 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
 2. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 (Z180) zinc coating.
 3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
 4. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.

2.8 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Masonry Joint Reinforcement, General: ASTM A 951/A951M.
1. Interior Walls: Hot-dip galvanized, carbon steel.
 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
 4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
 5. Wire Size for Veneer Ties: 0.148-inch (3.77-mm) diameter.
 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.

7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- D. Masonry Joint Reinforcement for Multiwythe Masonry:
 1. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.9 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16 mm) 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 A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
- C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 1. Connector Section: Mounting plate formed to accept wire tie section; formed from 0.108-inch- (2.66-mm-) thick steel sheet, galvanized after fabrication.
 - a. Product: Hohmann & Barnard; 345-BT Flexible Tie.
 2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
- D. Adjustable Masonry-Veneer Anchors:
 1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf (445-N) load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch (1.5 mm).
 2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch- (1.90-mm-) thick steel sheet, galvanized after fabrication.
 3. Fabricate wire ties from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized-steel wire unless otherwise indicated.
 4. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry veneer anchors specified.

5. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having holes for inserting vertical legs of wire tie formed to fit anchor section.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Heckmann Building Products, Inc.; 213 with 282.
 - 2) Hohmann & Barnard, Inc.; HB-200-X.
 - 3) Wire Bond; RJ-711.

6. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a gasketed sheet metal anchor section, 1-1/4 inches (32 mm) wide by 6 inches (152 mm) long, with screw holes top and bottom; top and bottom ends bent to form pronged legs of length to match thickness of insulation or sheathing; and raised rib-stiffened strap, 5/8 inch (16 mm) wide by 6 inches (152 mm) long, stamped into center to provide a slot between strap and base for inserting wire tie. Self-adhering, modified bituminous gasket fits behind anchor plate and extends beyond pronged legs.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Hohmann & Barnard, Inc.; DW-10-X.
 - 2) Wire Bond; Type III X.

7. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a corrosion-resistant, self-drilling, eye-screw designed to receive wire tie. Eye-screw has spacer that seats directly against framing and is same thickness as sheathing and has gasketed washer head that covers hole in sheathing.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Heckmann Building Products, Inc.; Pos-I-Tie.
 - 2) Hohmann & Barnard, Inc.; 2-Seal Tie.
 - 3) Wire Bond; SureTie.

2.10 EMBEDDED FLASHING MATERIALS

A. Flexible Flashing: Use the following, unless otherwise indicated:

1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive 32 mil rubberized-asphalt compound, bonded to a high-density, 8 mil cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - 2) Grace Construction Products, W.R. Grace & Co. – Conn.; Perm-A-Barrier wall flashing.
 - 3) Polyguard Products, Inc.; 400 Flashing.

2. Application: Unless otherwise indicated, use the following:

- a. Where flashing is indicated to receive counterflashing, use metal flashing.
- b. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
- c. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
- d. Where flashing is fully concealed, use flexible flashing.

B. Stainless Steel Drip Edge:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Illinois Products Corporation; 0.015-inch- (15-mil-) thick by 3-inch-wide stainless steel strip with a turned down hemmed drip edge or comparable product by one of the following:
 - a. Heckmann Building Products, Inc.
 - b. Hohmann & Barnard, Inc.
 - c. Sandell Manufacturing Co.

C. Stainless Steel Termination Bar:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hohmann & Barnard; T2 Termination Bar.

D. 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.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from closed cell neoprene, urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Weep/Vent Products: Use the following unless otherwise indicated:

1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.

a. Products: Subject to compliance with requirements, provide the following:

- 1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.

D. Cavity Drainage material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Advanced Building Products Inc.; Mortar Break II.
 - b. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
 - c. Mortar Net USA, Ltd.; Mortar Net.
2. Provide one of the following configurations:
- a. Strips, full-depth of cavity and 10 inches (250 mm) high, with dovetail shaped notches 7 inches (175 mm) deep that prevent clogging with mortar droppings at brick veneer and concrete masonry cavity walls.
 - 1) Thickness: 2 inches and 1 inch to fill full depth of cavity.
- E. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
1. Products: subject to compliance with requirements, provide one of the following:
 - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812, or D/A 817.
 - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
 - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
 - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.12 CAVITY –WALL INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type X, closed-cell product extruded with an integral skin.
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.13 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.14 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
 2. Use portland cement-lime mortar unless otherwise indicated.
 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. For masonry below grade or in contact with earth, use Type S.
 2. For reinforced masonry, use Type S.
 3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 3000 psi (21 MPa).
 3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.

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 work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed concrete masonry (CMU's) in running bond, face brick in one-third running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches (100-mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide ½-inch (13-mm) clearance between end of anchor rod and end of tube. Space anchors 48 inches (1200 mm) o.c. unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay concrete masonry units as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
- D. Cut joints flush for masonry walls concealed from view or that will other direct-applied finishes (other than paint), unless otherwise indicated.

3.5 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 bed joints of both wythes align, use ladder-type reinforcement extending across both wythes at interior masonry walls.
 - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforced with continuous horizontal wire in facing wythe attached to ties to wall for differential movement regardless of whether bed joints align.

- B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- C. Air barrier to be applied to face of backup wythe per Section 072726 “Fluid-Applied Membrane Air Barriers.”
- D. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
 - 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.6 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings.
- B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to masonry backup with masonry-veneer anchors to comply with the following requirements:
 - 1. Embed connector sections in masonry joints. Provide not less than 2 inches (50 mm) of air space between back of masonry veneer and face of cavity insulation.
 - 2. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 3. Space anchors as indicated, but not more than 16 inches (406 mm) o.c. vertically and 16 inches (406 mm) o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. (0.2 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 8 inches (203 mm), around perimeter.

3.8 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 the following methods:
 - 1. Install preformed control-joint gaskets designed to fit standard sash block.
- C. Form control 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 (10 mm) for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

3.9 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, AND CAVITY DRAINAGE

- 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. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows, unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of CMU backup, 16 inches (400 mm), and fastened with termination bar and sealant.
 - 3. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
 - 4. Install metal drip edges beneath flexible flashing at exterior face of wall at lintels only. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal drip edge.

5. Cut flexible flashing off 1/2 inch to 5/8 inch inboard of masonry face of wall where drip edges do not occur.
 6. Bond flexible flashing to metal drip edge and to top of veneer substrates with bonding adhesives recommended by flexible flashing manufacturer
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- E. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing, at top course, and as follows:
1. Use specified weep/vent products to form weep holes.
 2. Space weep holes 24 inches (600 mm) o.c., unless otherwise indicated.
- F. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

3.11 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.12 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to

perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

- B. Inspections: Level 1 special inspections according to the "International Building Code."
 - 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.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.13 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 non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.

5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.14 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 047200 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Cast-stone trim.

- B. Related Sections:

- 1. Section 042000 "Unit Masonry" for installing cast-stone units in unit masonry.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. For cast-stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: Show fabrication and installation details for cast-stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

- 1. Include building elevations showing layout of units and locations of joints and anchors.

- C. Samples for Verification:

- 1. For each color and texture of cast stone required, 10 inches (250 mm) square in size.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.

1.5 QUALITY ASSURANCE

- A. 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 Cast Stone Institute.

- B. Mockups: Furnish cast stone for installation in mockups specified in Section 042000 "Unit Masonry."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.
- B. Pack, handle, and ship cast-stone units in suitable packs or pallets.
 - 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast-stone units if required, using dollies with wood supports.
 - 2. Store cast-stone units on wood skids or pallets with non-staining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store mortar aggregates where grading and other required characteristics can be maintained, and contamination can be avoided.

1.7 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Cast Stone: Obtain cast-stone units from single source from single manufacturer.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality from one manufacturer for each cementitious component and from one source or producer for each aggregate.

2.2 CAST-STONE MATERIALS

- A. General: Comply with ASTM C 1364.
- B. Portland Cement: ASTM C 150/C 150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast-stone color indicated.
- C. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33/C 33M, gradation and colors as needed to produce required cast-stone textures and colors.
- D. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
- E. Admixtures: Use only admixtures specified or approved in writing by Architect.
 - 1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
 - 2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
 - 3. Air-Entraining Admixture: ASTM C 260/C 260M. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.
 - 4. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 5. Water-Reducing, Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 6. Water-Reducing, Accelerating Admixture: ASTM C 494/C 494M, Type E.
- F. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60 (Grade 420). Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches (38 mm) of cast-stone material.
 - 1. Galvanized Coating: ASTM A 767/A 767M.

2.3 CAST-STONE UNITS

- A. Manufacturers:
 - 1. Concrete Designs Inc., (800-279-2278).
 - 2. Advanced Architectural Stone (817-572-0018).
 - 3. AHI Supply, LP (281-388-4500).
 - 4. American Artstone Company (507-233-3700).
 - 5. Architectural Cast Stone, Inc. (316-262-5543).
 - 6. Dallas Cast Stone Company (214-428-6269).
 - 7. Midwest Cast Stone, Inc. (913-371-3300).
 - 8. Siteworks, Inc. (281-931-1000).
 - 9. Edwards Cast Stone Company (563-556-0535).
- B. Cast-Stone Units: Comply with ASTM C 1364.

1. Units shall be manufactured using the vibrant dry tamp or wet-cast method.
 2. Units shall be 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.
- C. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
 2. Provide drips on projecting elements unless otherwise indicated.
- D. Fabrication Tolerances:
1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch (3 mm).
 2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater, but in no case by more than 1/4 inch (6 mm).
 3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater.
 4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch (3 mm) on formed surfaces of units and 3/8 inch (10 mm) on unformed surfaces.
- E. 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 (38 deg C) for 12 hours or 70 deg F (21 deg C) for 16 hours.
 2. Keep units damp and continue curing to comply with one of the following:
 - a. No fewer than five days at mean daily temperature of 70 deg F (21 deg C) or above.
 - b. No fewer than six days at mean daily temperature of 60 deg F (16 deg C) or above.
 - c. No fewer than seven days at mean daily temperature of 50 deg F (10 deg C) or above.
 - d. No fewer than eight days at mean daily temperature of 45 deg F (7 deg C) or above.
- F. Acid etch units after curing to remove cement film from surfaces to be exposed to view.
- G. Colors and Textures: As selected by Architect from manufacturer's full range.

2.4 MORTAR MATERIALS

- A. Provide mortar materials that comply with Section 042000 "Unit Masonry."

2.5 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.

- B. Dowels: 1/2-inch- (12-mm-) diameter round bars, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.

2.6 MORTAR MIXES

- A. Comply with requirements in Section 042000 "Unit Masonry" for mortar mixes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING CAST STONE IN MORTAR

- A. Install cast-stone units to comply with requirements in Section 042000 "Unit Masonry."
- B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
 - 1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
 - 2. Coordinate installation of cast stone with installation of flashing specified in other Sections.
- C. Wet joint surfaces thoroughly before applying mortar or setting in mortar.
- D. Set units in full bed of mortar with full head joints unless otherwise indicated.
 - 1. Set units with joints 1/4 to 3/8 inch (6 to 10 mm) wide unless otherwise indicated.
 - 2. Build anchors and ties into mortar joints as units are set.
 - 3. Fill dowel holes and anchor slots with mortar.
 - 4. Build concealed flashing into mortar joints as units are set.
 - 5. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
- E. Point joints with sealant to comply with applicable requirements in Section 079200 "Joint Sealants."
 - 1. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- F. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.

1. Keep joints free of mortar and other rigid materials.
2. Build in compressible foam-plastic joint fillers where indicated.
3. Form joint of width indicated, but not less than 3/8 inch (10 mm).
4. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12 mm) maximum.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12 mm) maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch (1.5 mm), except where variation is due to warpage of units within tolerances specified.

3.4 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses.
 1. Remove mortar fins and smears before tooling joints.
 2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
 3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

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LEAVENWORTH, KANSAS

12-18101-00
BID SET

END OF SECTION 047200

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. Grout.

- B. Related Sections:

- 1. Division 01 Sections for independent testing agency procedures and administrative requirements.
- 2. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
- 3. Section 055000 "Metal Fabrications" for miscellaneous steel fabrications and other metal items not defined as structural steel.
- 4. Section 055100 "Metal Stairs."

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."

- B. Heavy Sections: Rolled and built-up sections as follows:

- 1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches (38 mm).
- 2. Welded built-up members with plates thicker than 2 inches (50 mm).
- 3. Column base plates thicker than 2 inches (50 mm).

1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering design by a qualified professional engineer licensed in the state which the project is located, 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.

3. For beams where no factored shear reaction is indicated, design connections to sustain one half the maximum uniform load for span length indicated in AISC 360, Table 3-6.
- B. Moment Connections: Type FR, fully restrained.
- C. Construction: As indicated.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 2. Include embedment drawings.
 3. 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.
 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 5. For structural-steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer, licensed in the state in which the project is located, responsible for their preparation.
 - a. Calculations must be submitted with the shop drawings for review.
 - b. Indicate all applicable piece marks on calculations sheets.
 - c. Design simple shear connections for maximum factored reaction indicated. If no reaction has been indicated, design simple shear connections to withstand one-half the maximum uniform load for the given beam span noted in the AISC Steel Construction Manual Table.
 - d. Design moment connections for factored reactions indicated. If no reaction is provided, design the moment connection for the maximum available moment capacity of the smaller beam member framing into the joint.
 - e. Design axial loaded members of trusses and bracing for the factored reactions indicated. If no reaction is indicated, design the member for the maximum tension and compression forces available to the member based on size and length. All bolted connection design shall account for net area reduction of the members.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
1. Power source (constant current or constant voltage).
 2. Electrode manufacturer and trade name, for demand critical welds.
- D. Qualification Data: For qualified Installer, fabricator, professional engineer, and testing agency.
1. Qualification Data must be submitted to Engineer prior to commencing work.
- E. Welding certificates.

- F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- G. Mill test reports for structural steel, including chemical and physical properties.
- H. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength bolt-nut-washer assemblies.
 - 4. Shear stud connectors.
 - 5. Shop primers.
 - 6. Nonshrink grout.
- I. Source quality-control reports.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
 - 1. As an exception, non-AISC certified fabricators will be accepted provided the fabricator includes in their bid the services of the owner's special inspection and testing agency to provide inspection / testing services for in-shop work to meet the requirements of IBC Section 1704 and any additional requirements noted in the construction documents. Final costs of these services will be as required by the owner's special inspection and testing agency, which may or may not be hired at the time of bidding the project. It will be the fabricator's responsibility for estimating these costs. Cost will be withheld from the fabricator to pay for these services. Refer to IBC Section 1705 for verification and inspection requirements.
 - 2. All inspection costs incurred by the Owner's inspection and testing agency for this exception will be tracked and invoiced to the owner independently of other special inspection costs to allow withholding from the relevant contractor's regular payments.
- B. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design and extent to that indicated for this Project and with a record of continuous successful in-service performance for a minimum of 5 years. Installer shall provide a list of projects completed within the last 5 years and shall include the names of the Architect, Engineer and General Contractor with contact information for each.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

- D. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. Preinstallation Conference: Conduct conference at Project site.

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/A 992M.
- B. Channels, Angles, S-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M, unless otherwise indicated on Drawings.

- D. Plate and Bar for Plate Girders: ASTM A 992 (Grade 50). ASTM A 572, Grade 50 is an acceptable substitute.
- E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- F. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
 - 1. Weight Class: Standard, unless otherwise indicated.
 - 2. Finish: Black except where indicated to be galvanized.
- G. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.
- H. Steel Forgings: ASTM A 668/A 668M.
- I. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.
- B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex 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 55, weldable, straight.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 3. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 4. Finish: Plain.
- E. Threaded Rods: ASTM A 36/A 36M.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 - 2. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 3. Finish: Plain, unless otherwise indicated.
- F. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

- G. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.
- H. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

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 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.

2.5 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. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning" and at architecturally exposed steel SSPC SP 3, "Power Tool Cleaning."
- F. 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.

- G. 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, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 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.

2.7 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 (50 mm).
 2. Surfaces to be field welded.
 3. Surfaces to be high-strength bolted with slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 5. 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 (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. 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.

2.8 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 lintels and shelf angles attached to structural-steel frame and located in exterior walls. Galvanize all structural steel not located in conditioned space in the final construction.

2.9 SOURCE QUALITY CONTROL

- A. This article is not applicable if fabricator is an "approved fabricator" by the Jurisdiction Having Authority in accordance with the building code. All shop testing and inspections costs incurred by the Owner's inspection and testing agency will be made payable by the fabricator. See Drawing Sheet S0.1 for further information and requirements. Submit approval certification to Architect/Engineer prior to commencing work.
- B. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- D. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
1. Liquid Penetrant Inspection: ASTM E 165.
 2. 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.
 3. Ultrasonic Inspection: ASTM E 164.
 - a. Test all Complete Joint Penetration (CJP) welds.
 4. Radiographic Inspection: ASTM E 94.
- F. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.

2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

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. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. 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.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. 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.

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. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. 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 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency'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.
 - 1) Test all Complete Joint Penetration (CJP) welds.
- d. Radiographic Inspection: ASTM E 94.
 - 2. Ultrasonic Inspection shall be performed on all complete joint penetration welds and other welds indicated.
- D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.
- E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

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: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. 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. Section Includes:

- 1. K-series steel joists.
- 2. Joist accessories.

- B. Related Requirements:

- 1. Section 033000 "Cast-in-Place Concrete" for installing bearing plates in concrete.
- 2. Section 051200 "Structural Steel Framing" for field-welded shear connectors.

1.3 DEFINITIONS

- A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product.

- B. Shop Drawings:

- 1. Include layout, designation, number, type, location, and spacing of joists.
- 2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
- 3. Indicate locations and details of bearing plates to be embedded in other construction.
- 4. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer licensed in the state which the project is located, responsible for its preparation, and included with the shop drawing submittal. Shop drawings without signed and sealed calculations will be considered incomplete and grounds for rejection.

- C. Qualification Data: For manufacturer and professional engineer.

- D. Welding certificates.
- E. Manufacturer certificates: Signed by manufacturer certifying that joist comply with requirements.
- F. Mill Certificates: Signed by bolt manufacturer certifying that bolts comply with requirements.
- G. Field quality-control test and inspection reports.
- H. Research/Evaluation Reports: For joists.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "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 Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 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.

1.7 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

PART 2 - PRODUCTS

2.1 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.

2.2 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 and KCS-type K-series steel joists.

- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

- C. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

- D. Provide holes in chord members for connecting and securing other construction to joists.

- E. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

- F. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

- G. Camber joists according to SJI's "Specifications."

- H. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.3 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

- B. Primer: Provide shop primer that complies with Division 09 painting Sections.

2.4 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. Fabricate steel bearing plates from ASTM A 36/A 36M steel with integral anchorages of sizes and thicknesses indicated. Shop prime paint.

- C. Steel bearing plates with integral anchorages are specified in Section 051200 "Structural Steel Framing."
- D. Furnish 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.
- E. 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, unless otherwise noted.
- F. 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, unless otherwise indicated.
- G. Welding Electrodes: Comply with AWS standards.
- H. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.5 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. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply one 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.
- D. Shop priming of joists and joist accessories is specified in Division 09 Painting Sections.

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.
- B. 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. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.
- 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. Bolt joists to supporting steel framework using carbon-steel bolts.
- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with Research Council on Structural Connection's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. 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 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.
- B. Visually inspect field welds according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, as applicable:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709.
 - c. Ultrasonic Testing: ASTM E 164.
 - d. Radiographic Testing: ASTM E 94.
- C. Visually inspect bolted connections.
- D. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."
- E. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

- F. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.4 PROTECTION

- A. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
 - 1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
 - 2. Apply a compatible primer of same type as primer used on adjacent surfaces.
- B. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.
- C. 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

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. Roof deck.
 - 2. Composite floor deck.
- B. Related Sections include the following:
 - 1. Section 033000 "Cast-in-Place Concrete" for concrete fill on metal decks.
 - 2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
 - 3. Section 075216 "Styrene-Isoprene-Butadiene (SBS-SIS) Modified Bituminous Membrane Roofing" for installation of sound-absorbing insulation in acoustical roof deck, furnished under this Section.

1.3 SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. 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.
- C. Product Certificates: For each type of steel deck, signed by product manufacturer.
- D. Welding certificates.
- E. Field quality-control test and inspection reports.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
 - 2. Acoustical roof deck
- G. Research/Evaluation Reports: For steel deck.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.
- B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- C. 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."
- D. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or pre-approved equal.
 - 1. Steel Deck:
 - a. ASC Profiles, Inc.
 - b. Canam Steel Corp.; The Canam Manac Group.
 - c. Consolidated Systems, Inc.
 - d. DACS, Inc.
 - e. D-Mac Industries Inc.
 - f. Epic Metals Corporation.
 - g. Marlyn Steel Decks, Inc.
 - h. Metal Dek Group; Unit of Csi.
 - i. New Millennium Building Systems, LLC.
 - j. Nucor Corp.; Vulcraft Division.
 - k. Roof Deck, Inc.
 - l. United Steel Deck, Inc.
 - m. Valley Joist; Division of EBSCO Industries, Inc.
 - n. Verco Manufacturing Co.
 - o. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

2.2 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. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 (230) minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer, unless noted otherwise.
 - a. Color: Manufacturer's standard.
 2. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer, where indicated on the drawings.
 - a. Color: Manufacturer's standard.
 3. Deck Profile: As indicated.
 4. Profile Depth: As indicated.
 5. Design Uncoated-Steel Thickness: As indicated.
 6. Span Condition: Triple or more span.
 7. Side Laps: Overlapped.

2.3 ACOUSTICAL ROOF DECK

- A. Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard.
 2. Deck Profile: As indicated.
 3. Profile Depth: As indicated.
 4. Design Uncoated-Steel Thickness: As indicated.
 5. Span Condition: Triple span or more.
 6. Side Laps: Overlapped.
 7. Acoustical Perforations: Deck units with manufacturer's standard perforated vertical webs.
 8. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber. Provide to roofing contractor to install.
- B. Acoustical Performance: NRC 0.70, tested according to ASTM C 423.

2.4 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 50, G60 (Z180) zinc coating, unless noted otherwise on drawings.
 2. Profile Depth: As indicated.
 3. Design Uncoated-Steel Thickness: As indicated.
 4. Span Condition: Triple or more span.

2.5 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws. Trim fasteners that stick through underside of metal deck.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch (1.52 mm) thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.
- J. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.
- K. Galvanizing Repair Paint: ASTM A 780.
- L. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

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.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck, except at perimeter edges of deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions. Mechanical fasteners must meet the same pull out and shear values as welds. Engineering calculations must be provided for Engineer's review.

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 (38 mm) long, and as follows:
 - 1. Weld Diameter: 5/8 inch (16 mm) nominal.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
 - 3. Weld Washers: Install weld washers at each weld location.

- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches (450 mm), and as follows, unless otherwise noted:
 - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
 - 1. End Joints: Lapped 2 inches (51 mm) 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 (305 mm) 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.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 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 (16 mm) nominal.
 - 2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
- 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 (910 mm), and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds at deck perimeter edge.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm) 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.
- F. Install piercing hanger tabs at 14 inches (355 mm) apart in both directions, within 9 inches (228 mm) of walls at ends, and not more than 12 inches (305 mm) from walls at sides, unless otherwise indicated.

3.5 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. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
 - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
- C. 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

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. Section Includes:

- 1. Exterior non-load-bearing wall framing.
- 2. Soffit framing.

- B. Related Requirements:

- 1. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
- 2. Section 092216 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings:

- 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
- 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

- C. Delegated-Design Submittal: For cold-formed steel framing.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.

- B. Welding certificates.

- C. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association or the Steel Stud Manufacturers Association.
- D. 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."
- E. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two-Family Dwellings."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AllSteel & Gypsum Products, Inc.
 - 2. California Expanded Metal Products Company.
 - 3. ClarkWestern Building Systems, Inc.
 - 4. Consolidated Fabricators Corp.; Building Products Division.
 - 5. Craco Mfg., Inc.
 - 6. Custom Stud Inc.
 - 7. Design Shapes in Steel.
 - 8. Dietrich Metal Framing; a Worthington Industries Company.
 - 9. Formetal Co. Inc. (The).
 - 10. MarinoWARE.
 - 11. Nuconsteel; a Nucor Company.
 - 12. Olmar Supply, Inc.
 - 13. Quail Run Building Materials, Inc.
 - 14. SCAFCO Corporation.
 - 15. Southeastern Stud & Components, Inc.
 - 16. State Building Products, Inc.
 - 17. Steel Construction Systems.
 - 18. Steel Network, Inc. (The).
 - 19. Steel Structural Systems.
 - 20. Steeler, Inc.

21. Super Stud Building Products, Inc.
22. Telling Industries, LLC.
23. United Metal Products, Inc.
24. United Steel Manufacturing.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 1. Design Loads: As indicated on Drawings.
 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
 - b. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.
 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
 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 (25 mm).
 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
 1. Wall Studs: AISI S211.
 2. Headers: AISI S212.
 3. Lateral Design: AISI S213.
- D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: ST33H (ST230H) for thicknesses less than 0.05-inches, ST50H (ST340H) for other thicknesses.
 2. Coating: G60 (Z180), A60 (ZF180) or AZ50 (AZ150).
- 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 (340), Class 1 or 2.
 2. Coating: G90 (Z275).

2.4 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: 0.0538 inch (1.37 mm).
 2. Flange Width: 1-5/8 inches (41 mm).
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: Matching steel studs.
 2. Flange Width: 1-1/4 inches (32 mm).
- C. Vertical Deflection Clips: Manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web. Mechanical attachment to structure and screw attachment to stud web using step-bushings to permit frictionless vertical movement; 68 mils (1.72 mm) minimum thickness size as required by structural design calculations.
1. Basis-of-Design Product: Subject to compliance with requirements, provide The Steel Network, Inc.; Verticlip™ including step bushings.
 - a. Exterior Head of Wall: The Steel Network, Inc.; Verticlip™ SL.
 - b. Exterior Head of Wall Preassembled with Track: The Steel Network, Inc.; Verticlip™ VTX.
 - c. By-pass Structural Pour Stop at Floor Slab: The Steel Network, Inc.; Verticlip™ SLB.
 - d. By-pass Floor Slab or Structure: The Steel Network, Inc.; Verticlip™ SLT.
 - e. By-pass Structure: The Steel Network, Inc.; Verticlip™ SLS.
 - f. Pre-approved equal.
- D. Rigid Clip Angles: Manufacturer's standard rigid clip for attachment to structure and stud web.

1. Basis-of-Design Product: Subject to compliance with requirements, provide The Steel Network, Inc.; StiffClip™ CL.

2.5 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm).
 2. Flange Width: 1-5/8 inches (41 mm), minimum.

2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.
 4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.
 8. Stud kickers and knee braces.
 9. Joist hangers and end closures.
 10. Hole-reinforcing plates.
 11. Backer plates.

2.7 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. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780/A 780M, SSPC-Paint 20.
- B. Cement Grout: Portland cement, ASTM C 150/C 150M, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1-part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, non-staining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.
- D. Shims: Load-bearing, high-density, multimonomer, non-leaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.9 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.
- C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.
- C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch (6 mm) to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners, install according to Shop Drawings, and comply 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 equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches (406 mm).
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to bypassing and infill studs and anchor to building structure.

4. Connect drift clips to cold-formed steel framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 ERECTION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.6 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

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END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for overhead doors.
2. Steel framing and supports for countertops.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Support angles for elevator door sills.
6. Metal bollards.
7. Metal ladders.
8. Metal ship's ladders.
9. Pipe grid.
10. Unistrut.
11. Vertical stainless-steel pipe tubing for MDF boards.
12. Vertical Aluminum sunshades.
13. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Section 051200 "Structural Steel Framing."

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 2. Prefabricated building columns.
 - 3. Metal nosings and treads.
 - 4. Paint products.
 - 5. Grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
 - 1. Steel framing and supports for operable partitions.
 - 2. Steel framing and supports for overhead doors.
 - 3. Steel framing and supports for countertops.
 - 4. Steel framing and supports for mechanical and electrical equipment.
 - 5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 6. Metal bollards.
 - 7. Metal ladders.
 - 8. Metal ship's ladders.
 - 9. Pipe grid.
 - 10. Unistrut.
 - 11. Vertical stainless-steel pipe tubing.
 - 12. Vertical Aluminum sunshades.
 - 13. Loose steel lintels.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- C. Welding certificates.

- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 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."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.
- B. Structural Performance of Aluminum Ladders: Aluminum ladders shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- C. Structural Performance of Vertical Stainless Steel Pipe Tubing: Design for all dead loads and a maximum horizontal deflection of $L/240$ for total overall height of assembly based on minimum horizontal loading of 5 lbf/sq.ft.
- 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

- C. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304.
- D. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- E. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- F. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: As required for each specific situation but not less than 1-5/8 by 1-5/8 inches (41 by 41 mm).
 - 2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33 (Grade 230), with G90 (Z275) coating; 0.079-inch (2-mm) nominal thickness.
- G. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), 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 (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3 (ASTM A 325M, Type 3); with hex nuts, ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3); and, where indicated, flat washers.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. 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/E 488M, conducted by a qualified independent testing agency.
- F. 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.
- G. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with

temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide product compatible with system as required per Sections 09 9113 "Exterior Painting," 09 9123 "Interior Painting," or 09 9601 "High-Performance Coatings" as appropriate for location and painting system indicated.
- B. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- G. 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 (20 MPa).

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) 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 are 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.
- J. 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 (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 1. Fabricate units from slotted channel framing where indicated.
 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Galvanize miscellaneous framing and supports where indicated.
- E. Prime miscellaneous framing and supports with zinc-rich primer where not indicated to be galvanized.

2.7 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.

2.8 METAL LADDERS

A. Steel Ladders:

1. Space siderails 16 inches (406 mm) apart unless otherwise indicated.
2. Siderails: Continuous, 3/8-by-2-1/2-inch (9.5-by-64-mm) steel flat bars, with eased edges.
3. Rungs: 3/4-inch- (19-mm-) diameter steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung by coating with abrasive material metallurgically bonded to rung.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Harsco Industrial IKG, a division of Harsco Corporation; Mebac.
 - 2) SlipNOT Metal Safety Flooring, a division of W. S. Molnar Company; SlipNOT.
6. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.

B. Galvanize ladders, including brackets and fasteners, in the following locations:

1. Exterior.
2. Interior.

2.9 METAL SHIPS' LADDERS

- ### A. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers, pipe and tube railings, and bar grating treads, unless otherwise indicated. Provide brackets and fittings for installation.
1. Fabricate ships' ladders, including treads and railings from steel.
 2. Comply with applicable requirements in Division 05 Section "Pipe and Tube Railings" for railings.
- ### B. Prime interior steel ships' ladders with zinc-rich primer.

2.10 PIPE GRID

- ### A. Pipe Grid at Art Room: 25'-0" x 15'-0" suspended at 11'-0" a.f.f. Provide (6) 1-1/2-inch Schedule 40 pipes at 15'-0". Provide (4) 1 1/2-inch Schedule 40 pipes at 25'-0". Rig with 1/4-inch 7x19 aircraft cable with turnbuckle rated for overhead lifting at each pick point for final leveling. Attach to pipe grid with H&H 680 clamps. Double wrap cable is not acceptable. Provide Mega Grid Clamps at crossovers.

2.11 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize and prime exterior miscellaneous steel trim.

2.12 UNISTRUT

- A. Materials: All channel members shall be fabricated from structural grade steel conforming to one of the following ASTM specifications – A1011 SS GR or A653 GR 33. All fittings shall be fabricated from steel conforming to one of the following ASTM specifications – A575, A576, A36 or A635.
- B. Finishes: Hot-Dipped Galvanized – zinc coated after all manufacturing operations are complete. Coating shall conform to ASTM A123 or A153.
- C. Structural Loading: Attach to structure per manufacturer's recommendations. Center spline at all locations to accommodate 300 lb. maximum loading.

2.13 VERTICAL STAINLESS-STEEL BAR TUBING

- A. Vertical stainless-steel pipe tubing: Of diameter required by performance requirements, but not less than 2-inch (48-mm) outside diameter, stainless steel and other fittings and accessories for securing MDF panels as indicated on the Drawings.
 - 1. Provide longest lengths available up to maximum of one splice to be located and concealed behind the MDF panels.
 - 2. Finish: Directional satin finish polish No. 4.

2.14 VERTICAL ALUMINUM SUNSHADES

- A. Delegated Design: Engage a qualified professional engineer, licensed to practice in Kansas to design Perforated Metal Sun Shade Systems including perforated panel assemblies and all attachment assemblies.
- B. Perforated Metal Sun Shade Systems: Provide factory-formed and assembled, vertical fin shade elements fabricated from metal plate connected to a vertical support frame that attaches to building structure as illustrated in the Architectural Drawings.
 - 1. System to consist of aluminum plates, perforated, as illustrated, to create a system of custom aluminum sun shade features per the building elevations.

2. System must attach directly to building's water proof membrane, in a manner similar to illustrated in Architectural details. All attachments to building to be caulked and sealed during installation sequence.
 3. System to consist of 3 panels, equally sized, per bay assembly.
 4. Overall system projection shall be maximum of 30" from attachment hardware placed on building's water proof membrane finished face.
 5. System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise to a neat and flat appearance, except as illustrated.
- C. Basis-of-Design Product: Subject to compliance with requirements, provide Perforated Metal Sun Shade Systems assembly as detailed by, Standard Sheet Metal, 405 North Olive Street, Kansas City, MO 64120. (816) 221 – 5434.
1. Aluminum alloy 3003 (paint quality) conforming to ASTM B209.
 2. Panel Thickness: 3/16-inch aluminum plate.
 3. Exterior Finish: Factory Finish, Three-coat fluoropolymer.
 - a. Color: Clear Anodized to match Architects sample.
- D. Delegated design by manufacturer/fabricator. Provide removable perforated panel and substructure assembly, to attach to structural as directed. Design panels and attachments that allows the panels to be removed, with conventional tools and accessed with conventional maintenance lifts, to access any glazing components adjacent to the system for regular maintenance and cleaning of glass.
1. Comply with standards and structural requirements in this Section.
 2. Perforations: Refer to drawings for pattern and location of perforated panels.
 3. Perforated panels to be supplied by same supplier as exterior cladding fabricator/installer.
 4. Panel manufacturer must fully warrant perforated panels with the same warranty as solid face panels.
 5. Panel Thickness: Minimum required to meet loading requirements but not less than 3/16-inch.
 6. Finish substructure components and fasteners to match.
 7. Finish both sides (front and back) of perforated panel.
 8. Finish material to Match [MP-1].
 9. Color: Clear anodized to match Architects sample.
 10. Panel Fasteners: Concealed self-tapping screws and fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of factory-applied coating. Provide EPDM sealing washers for exposed fasteners where needed to maintain water tightness. Provide Type 316 stainless-steel fasteners for exterior use Select fasteners for type, grade, and class required.
 - a. 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 2.
- E. Fabrication:
1. 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. Comply with indicated profiles and with dimensional and structural requirements.

2. Provide furring or shims as necessary to ensure system alignment and flatness per specified tolerances.

F. Panel Fabrication Tolerances:

1. Fabricated panel tolerances:

- a. Width: + / - 0.04 inch/3 feet (1mm/m).
- b. Length: + / - 0.04 inch/3 feet (1mm/m).
- c. Bow: Maximum 0.5% length or width.
- d. Square: Maximum 0.2 inch (5.1mm).

2. Panel Dimensions: Field modification to panels shall not be allowed.
3. Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.
4. Fabricate panel system to dimension, size, and profile indicated on the drawings based on a design temperature of 70°F.
5. Fabricate panel system so that no restraints can be placed on the panel, which might result in compressive skin stresses due to expansion or contraction.

G. Finishes:

1. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
2. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.15 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.
- C. Prime plates with zinc-rich primer.

2.16 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 (200 mm) unless otherwise indicated.
- C. Galvanize and prime loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.17 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.

2.18 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.19 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. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with primers specified in Section 099113 "Exterior Painting" unless indicated.
- D. Preparation for Shop Priming: Clean surfaces to be painted per primer manufacturer's written instructions. Remove loose rust and mill scale and other spatter, slag, flux deposits, and any other potential bond-breaking materials.

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.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions and overhead doors securely to, and rigidly brace from, building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING METAL BOLLARDS

- A. Anchor bollards to existing construction with expansion anchors. Provide four 3/4-inch (19-mm) bolts at each bollard, unless otherwise indicated.
 1. Embed anchor bolts at least 4 inches (100 mm) in concrete.
- B. Anchor bollards in concrete in formed or core-drilled holes not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) larger than OD of bollard. 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 (3 mm) toward bollard.
- C. Fill bollards solidly with concrete, mounding top surface to shed water.

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 nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 INSTALLATION OF VERTICAL ALUMINUM SUNSHADES

- A. Examination: Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal composite material 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 metal sun shade 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 material wall panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
 3. Examine roughing-in for components and assemblies penetrating metal panel work zones to verify actual locations of penetrations relative to locations of metal panels before installation.
 4. Inspect work and notify air-barrier installer of any damage the air -barrier materials for repair prior to the installation of insulation and cladding systems.

5. Proceed with installation only after unsatisfactory conditions have been corrected and accepted in writing by the installer.
- B. Start of execution for work of this Section constitutes acceptance of substrate and site conditions by the installer.
- C. Installation of Vertical Aluminum Sunshades: Install metal panel systems according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal composite material panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Commence metal wall panel installation and install sun shade panels prior to exterior insulation system and cladding.
 2. Shim or otherwise plumb substrates receiving metal panels.
 3. Fasteners:
 - a. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
 - b. Stainless-Steel Panels: Use stainless-steel fasteners
- D. Erection Tolerances: Shim and align metal panel units within installed tolerance.
 1. Maximum deviation from horizontal and vertical installed panels of 1/4 inch in 20 feet non-accumulative.
 2. Maximum deviation from panel edge and face alignment: 1/16-inch.
- E. Cleaning and Protection: 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 panel manufacturer. Others to maintain metal panels in a clean condition during construction.

3.6 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 (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

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END OF SECTION 055000

SECTION 055113 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Preassembled steel stairs with concrete-filled treads.

- B. Related Requirements:

- 1. Section 033000 "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Coordinate locations of hanger rods and struts with other work so that they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.

1.4 ACTION SUBMITTALS

- A. Product Data: For metal pan stairs and the following:

- 1. Prefilled metal-pan-stair treads.
 - 2. Paint products.
 - 3. Stair tread risers.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

- C. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 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 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available products include, but are not limited to, the following manufacturers:
 - 1. Alfab, Inc.
 - 2. American Stair, Inc.
 - 3. Lapeyre Stair Inc.
 - 4. Pacific Stair Corporation.
 - 5. Worthington Metal Fabricators.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs and railings.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
 - 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 - 5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.

2.3 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- D. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.
- E. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30 (Grade 205), unless another grade is required by design loads.

2.4 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

2.5 MISCELLANEOUS MATERIALS

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. 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.
- D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- G. Concrete Materials and Properties: 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 (20 MPa) unless otherwise indicated.
- H. Welded Wire Reinforcement: ASTM A 185/A 185M, 6 by 6 inches (152 by 152 mm), W1.4 by W1.4, unless otherwise indicated.

2.6 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 4 welds: good quality, uniform undressed weld with minimal splatter.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.7 STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Commercial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
 - 1. Fabricate stringers of steel tubes.
 - a. Provide closures for exposed ends of stringers.
 - 2. Construct platforms of steel channel headers and miscellaneous framing members as needed to comply with performance requirements.
 - 3. Weld stringers to headers; weld framing members to stringers and headers.
- 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 (1.7 mm).
 - 1. Steel Sheet: Uncoated cold-rolled steel sheet.
 - 2. Directly weld metal pans to stringers; locate welds on top of subtreads where they are concealed by concrete fill. Do not weld risers to stringers.
 - 3. 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.
 - 4. Shape metal pans to include nosing integral with riser.
 - 5. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete during fabrication.
 - 6. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.8 STAIR RAILINGS

- A. Comply with applicable requirements in Section 055000 "Metal Fabrications" and Section 055213 "Pipe and Tube Railings."
 - 1. Rails may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
 - 2. Connect plate steel to stair framing by direct welding unless otherwise indicated.
- B. Form changes in direction of railings as follows:
 - 1. Cold or hot rolled.
- C. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- D. 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 (6 mm) or less.

- E. Connect steel plate to stair framing by direct welding unless otherwise indicated.
- F. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
 - 1. For galvanized railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
 - 2. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
 - 3. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.
- G. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.9 FINISHES

- A. Finish metal stairs after assembly.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- D. 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 INSTALLING METAL PAN STAIRS

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- G. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."

3.2 INSTALLING RAILINGS

- A. Adjust railing systems before welding to ensure matching alignment at abutting joints. Space tubes at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
 - 1. Anchor tubes to steel as detailed.
 - 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055113

SECTION 057300 - DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Steel and iron railings with stainless-steel wire-rope guard infill.
 - 2. Stainless-steel pipe handrails.

- B. Related Requirements:

- 1. Section 055113 "Metal Pan Stairs" for decorative metal railings associated with metal pan stairs.

1.3 DEFINITIONS

- A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.4 COORDINATION AND SCHEDULING

- 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.
- 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 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 meet structural performance requirements.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:

- 1. Manufacturer's product lines of railings assembled from standard components.

2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, and attachment details.

C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

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.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

C. Welding certificates.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.

E. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.7 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Stainless Steel: 60 percent of minimum yield strength.
 2. Steel: 72 percent of minimum yield strength.
- C. Structural Performance: Railings, including attachment to building construction, 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. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) 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 (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

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: Same metal and finish as supported rails unless otherwise indicated.
1. Provide formed-steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.

2.3 STAINLESS STEEL WIRE ROPE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide CarlStahl DécorCable Innovations LLC, X-tend or comparable product by one of the following:
1. Cable Connection (The).
 2. Esmet, Inc.
 3. Feeney Wire Rope & Rigging.
 4. Hayn Enterprises, LLC.
 5. Johnson, C. Sherman, Co., Inc.
 6. Loos & Co. Inc.; Cableware Division.
 7. Ronstan International Inc.
 8. Sava Industries, Inc.

9. Seco South, Inc.

B. Wire Rope: 7-by-19 wire rope made from wire complying with ASTM A 492, Type 316.

C. Wire-Rope Fittings: Connectors of types indicated, fabricated from stainless steel, and with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

2.4 STAINLESS STEEL

A. Pipe: ASTM A 312/A 312M, Grade TP 304.

2.5 STEEL AND IRON

A. Plates, Shapes, and Bars: ASTM A36/A36M.

2.6 STAINLESS-STEEL FITTINGS AND FASTENERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide CarlStahl DécorCable Innovations LLC, I-SYS INOX Brand or comparable product by one of the following:

1. Cable Connection (The).
2. Esmet, Inc.
3. Feeney Wire Rope & Rigging.
4. Hayn Enterprises, LLC.
5. Johnson, C. Sherman, Co., Inc.
6. Loos & Co. Inc.; Cableware Division.
7. Ronstan International Inc.
8. Sava Industries, Inc.
9. Seco South, Inc.

B. General: Provide the following:

1. Stainless-Steel Components: Type 316 stainless-steel fasteners.
2. Dissimilar Metals: Type 316 stainless-steel fasteners.

C. 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.

1. Spacer Bar: Model number 919-080.
2. Clamp Screw: Model number 923-0800-22.
3. Cover Disk: Model number 836-0800-05.

D. Anchors: Provide torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in

concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.7 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Uncoated Steel Components: Plated-steel fasteners complying with ASTM B633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed; Type 304 stainless-steel fasteners where exposed.
- B. Fasteners for Anchoring 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. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated, exposed fasteners are unavoidable, exposed fasteners are the standard fastening method for railings indicated.
 - 1. Provide Phillips, tamper-resistant, square or hex socket flat-head machine screws for exposed fasteners 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 (ASTM F1941M), Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

2.8 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Shop Primers: Provide primers that comply with Section 099123 "Interior Painting."

2.9 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. Make up wire-rope assemblies in the shop to field-measured dimensions with fittings machine swaged. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning wire ropes. Tag wire-rope assemblies and fittings to identify installation locations and orientations for coordinated installation.
- D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- E. Form work true to line and level with accurate angles and surfaces.
- F. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.
- G. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- H. Connections: Fabricate railings with welded connections unless otherwise indicated.
- I. 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 welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.
- J. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- K. Form changes in direction as follows:
 - 1. As detailed.
- L. 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.
- M. Close exposed ends of hollow railing members with prefabricated end fittings.
- N. 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 (6 mm) or less.

- O. 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 to prevent bracket or fitting rotation and crushing of substrate.
- P. 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.
- Q. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

2.10 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. 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.

2.11 STAINLESS STEEL FINISHES

- A. Remove tool and die marks and stretch lines, or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Directional Satin Finish: No. 4.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.12 STEEL AND IRON FINISHES

- A. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves.

- B. Preparing Nongalvanized Items for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below:
- C. 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 Section 099123 "Interior Painting" unless indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and 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 (2 mm in 1 m).
 - 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 (5 mm in 3 m).
- 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. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "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 (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) 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.
- C. Cover anchorage joint with flange of same metal as post, attached to post with set screws.
- D. Leave anchorage joint exposed with anchoring material flush with adjacent surface.
- E. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel railings, weld flanges to posts and bolt to metal-supporting surfaces.

3.5 ATTACHING RAILINGS

- A. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.
- B. Attach handrails to walls with wall brackets except where end flanges are used. Provide brackets with 1-1/2-inch (38-mm) 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. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. 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. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
4. For steel-framed partitions, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.
5. For steel-framed partitions, fasten brackets with toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 CLEANING

- A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material 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 (0.05-mm) dry film thickness.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

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.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION 057300

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Wood blocking, cants and nailers.
 - 2. Plywood backing panels.

- B. Related Requirements:

- 1. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater size but less than 5 inches nominal (114 mm actual) size in least dimension.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Metal framing anchors.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 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. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 3. Dress lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.

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, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat all miscellaneous carpentry unless otherwise indicated.
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - 4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
2. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Nailers.
 3. Rooftop equipment bases and support curbs.
 4. Cants.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
1. Hem-fir (north); NLGA.
 2. Mixed southern pine or southern pine; SPIB.
 3. Spruce-pine-fir; NLGA.
 4. Hem-fir; WCLIB or WWPA.
 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 6. Western woods; WCLIB or WWPA.
 7. Northern species; NLGA.
 8. Eastern softwoods; NeLMA.
- C. Concealed Boards: 19 percent maximum moisture content of any of the following species and grades:
1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
 2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 4. Eastern softwoods, No. 2 Common grade; NELMA.
 5. Northern species, No. 2 Common grade; NLGA.
 6. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.
- 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.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Screws for Fastening to Metal Framing: ASTM C 954, length as recommended by screw manufacturer for material being fastened.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - 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).
 - 2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate nailers, blocking and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- G. Sort and select lumber so that natural characteristics do 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.
- H. 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.
- I. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- J. 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.
 - 2. ICC-ES evaluation report for fastener.
- K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Wall sheathing.
- 2. Parapet sheathing.

- B. Related Requirements:

- 1. Section 061053 "Miscellaneous Rough Carpentry" for plywood backing panels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

- 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.

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 WOOD PANEL PRODUCTS

- A. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

- C. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat all plywood unless otherwise indicated.

2.3 WALL SHEATHING

- A. Glass-Mat Gypsum Wall Sheathing: Gypsum sheathing board consisting of noncombustible gypsum core incorporating a water-resistant material, surfaced on face and back with inorganic glass fiber mats, and with unsurfaced square edges; complying with ASTM C 1177, and requirements indicated below:
 - 1. Type: Regular, 1/2-inch thickness.
 - 2. Size: 48 by 96 inches.
 - 3. Products: Subject to compliance with requirements, provide the following:
 - a. G-P Gypsum Corporation; Dens-Glass Gold.
 - b. USG Company; Fiberock Aqua Tough.
 - 4. Primed at backs of parapet walls.
- B. Plywood Wall Sheathing: Exterior sheathing.
 - 1. Span Rating: Not less than 42/0.
 - 2. Nominal Thickness: Not less than 1/2 inch (13 mm).

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

- D. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
 - 1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.
- E. Screws for Fastening Wood Structural Panels 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.

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 the ICC's International Building Code.
 - 2. ICC-ES evaluation report for fastener.
- D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
 - 3. Install panels with a 1/4-inch (6.4-mm) 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, but do not cut into facing.
- C. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.

3.3 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Screw to cold-formed metal framing.
 - b. Space panels 1/8-inch (3 mm) apart at edges and ends.

END OF SECTION 061600

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

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. Upholstered booths and tables.
 - 2. Medium density fiberboard (MDF) panels.
 - 3. Hardware incorporated with finish carpentry work.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 055000 "Metal Fabrications" for hanging medium density fiberboard (MDF) panels on vertical stainless-steel bar tubing.
 - 2. Section 061053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
 - 3. Section 099123 "Interior Painting" for painting the medium density fiberboard (MDF) panels.

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.
- B. Opaque or Paint Finish: A pigmented finish that completely conceals the configuration of the grain of the wood.

1.4 SUBMITTALS

- A. Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.
- C. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details at drawing scale of 1-1/2" = 1'-0".
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other Sections.

D. Samples for verification of the following:

1. Medium Density Fiberboard (MDF) Panels.
2. Upholstered materials for booths.

E. Product certificates signed by woodwork fabricator certifying that products comply with specified requirements.

F. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing architectural woodwork 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 without delaying the Work.

B. Installer Qualifications: Arrange for interior architectural woodwork installation by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this Project.

C. Single-Source Responsibility for Fabrication and Installation: Engage a qualified woodworking firm to assume undivided responsibility for fabricating, finishing, and installing woodwork specified in this Section.

D. Quality Standard: Except as otherwise indicated, comply with the following standard:

1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grades of interior architectural woodwork, construction, finishes, and other requirements.
 - a. Provide AWI Certification Labels or Certificates of Compliance indicating that woodwork meets requirements of grades specified.
2. The Contract Documents contain selections chosen from options in the Quality Standard as well as additional requirements beyond those of the Quality Standard. Comply with such selections and requirements in addition to the Quality Standard.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

- B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Obtain and comply with woodwork fabricator's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork will be within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.
- B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.
 - 2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2.
 - 3. Particleboard: ANSI A208.1, Grade M-2, medium density.
 - 4. Softwood Plywood: PS 1.

- B. Formaldehyde Emission Level for Medium-Density Fiberboard: Comply with requirements of NPA 9.
- C. Fiberboard Panels: Medium-density fiberboard (MDF) and complying with ANSI A208.2.

2.2 INSTALLATION MATERIALS

- A. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.
 - 1. For metal framing supports, provide screws as recommended by metal-framing manufacturer.
- B. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
- C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.
- D. Adhesives, General: Adhesives shall not contain urea formaldehyde.

2.3 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:
 - 1. Grade: Custom.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated.
- D. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Trial fit assemblies at the fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on approved shop drawings before disassembling for shipment.
- E. Shop-cut openings, to maximum extent possible, to receive hardware and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings.

2.4 MEDIUM DENSITY FIBERBOARD PANELS

- A. Products: Subject to compliance with requirements, provide the following or an approved equal:
1. Arcdecor Fabrications, Inc.; Custom MDF Panels.
- B. Shop Finishing: Opaque finish:
1. Colors: Provide the following:
 - a. P-6: SW6966 Blueblood.
 - b. P-9: SW6545 Majestic Purple.
 - c. P-11: SW6719 Gecko.
 - d. P-13: SW6650 Marquis Orange.
 2. AWI Finish System: Colored precatalyzed lacquer.

2.5 UPHOLSTERED BOOTHS AND TABLES

- A. Upholstered Booths:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Shelby Williams; WB Style, Double Booth, custom dimensions to match Architectural Drawings or an approved equal by one of the following:
 - a. Beaufurn.
 - b. KC Booth.
 - c. West Coast Industries.
 2. Back Upholstery:
 - a. UF1:
 - 1) Manufacturer: Design Tex.
 - 2) Pattern: 3495 Beguiled by the Wild.
 - 3) Colors:
 - a) UF-1a: 404 Blue Jay.
 - b) UF-1b: 601 Anenome.
 - c) UF-1c: 401 Iguana.
 3. Seat Upholstery:
 - a. UF2:
 - 1) Manufacturer: Arc-Com.
 - 2) Pattern: Glam.
 - 3) Colors:
 - a) UF-2a: Midnight #24.

- b) UF-2b: Aubergine #18.
- c) UF-2c: Grass #20.

B. Booth Tables:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Shelby Williams; FE Series top and B53 Series base, custom dimensions to match Architectural Drawings, or an approved equal by one of the following:
 - a. Beaufurn.
 - b. KC Booth.
 - c. West Coast Industries.
2. Base Height: Wheelchair height at 30 inches.
3. Base Finish: Satin Chrome.
4. Top Style: Self-edge top.
5. Top Finish: Plastic Laminate (PL3), Wilsonart; SOLICOR™, D354 Designer White, High Gloss.
6. Table Supports: Table tops to be supported on wall at one end with in-wall support brackets, and with single pedestal base (by booth manufacturer) at opposite end (open end of booth).
 - a. In-Wall Support Brackets: Rakks® Inside Wall Flush Mount, or approved equal.
 - 1) Size: 12 in. high by 9 in. deep or as required; confirm size requirements with booth manufacturer.
 - 2) Finish: Primed for painting; paint to match wall, U.N.O.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for plumb and level (including tops).
- C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

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 semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 064023

SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS AND
MILLWORK

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. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.
3. Custom plastic-laminate-faced millwork.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
2. Section 123623.13 "Plastic-Laminate-Clad Countertops."

1.3 ACTION SUBMITTALS

- A. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for electrical switches and outlets installed in architectural plastic-laminate cabinets.

B. Samples for Initial Selection:

1. Plastic laminates.
2. PVC edge material.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

- B. 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. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
- C. Quality Standard: Except as otherwise indicated, comply with the following standard:
 - 1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grades of interior architectural woodwork, construction, finishes, and other requirements.
 - 2. Provide AWI Certification Labels or Certificates of Compliance indicating that woodwork meets requirements of grades specified.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70 percent during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets 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 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS AND MILLWORK

- A. Grade: Custom.
- B. Type of Construction: Frameless.
- C. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- D. Reveal Dimension: 1/2 inch (13 mm).
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
- F. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS.
 - 4. Edges: High pressure decorative laminate, same color and finish.
 - 5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- G. Materials for Semi-Exposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
 - b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
 - c. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of thermoset decorative panels.
- H. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.
- I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

- J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
- K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. Refer to Section 123216 "Manufactured Plastic Laminate Clad Casework" for finishes.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Composite Wood and Agrifiber Products: Products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
 - 3. Particleboard: ANSI A208.1, Grade M-2.
 - 4. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Environ Biocomposites Manufacturing LLC; Biofiber Wheat.
 - 2) Sorm Incorporated; Primeboard Premium Wheat.
 - 5. Softwood Plywood: DOC PS 1, medium-density overlay.
 - 6. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.
 - 7. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 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 (70-mm), five-knuckle steel hinges made from 0.095-inch- (2.4-mm-) thick metal, and as follows:

1. Semi-concealed Hinges for Flush Doors: BHMA A156.9, B01361.
 2. Semi-concealed 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 (100 mm) long, 5/16 inch (8 mm) in diameter.
- E. Catches: Roller catches, BHMA A156.9, B03071.
- F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112.
- G. Shelf Rests: BHMA A156.9, B04013; metal.
- H. Door Locks: BHMA A156.11, E07121.
- I. Door Silencers: BHMA A156.16, L03011.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Stainless Steel: BHMA 630.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate cabinets to dimensions, profiles, and details indicated.

- C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1. Use filler matching finish of items being installed.

- F. Cabinets: Install without distortion so doors 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 (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, 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 cabinets on exposed and semi-exposed surfaces.

END OF SECTION 064116

SECTION 066400 - PLASTIC PANELING – FRP

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Plastic sheet paneling.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING

- A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319. Panels shall be USDA accepted for incidental food contact.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Crane Composites, Inc.; Matrex GCT Solid Color Gel-Coat or a comparable product by one of the following:
 - a. Glasteel.
 - b. Marlite.

- c. Newcourt, Inc.
 - d. Nudo Products, Inc.
 - e. Parkland Plastics, Inc.
2. Color: Selected by the Architect from manufacturer's full range of colors.
 3. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 200 or less.
 - b. Smoke-Developed Index: 450 or less.
 4. Nominal Thickness: Not less than 0.09 inch (2.3 mm).
 5. Surface Finish: Smooth surface with filled grooves at 4 inches (102 mm) o.c. to resemble tile.

2.3 ACCESSORIES

- A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
 1. Color: Match panels.
- B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.
- C. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.
- D. Sealant: Mildew-resistant, single-component, neutral-curing or acid-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.

- B. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- C. Lay out paneling before installing. Locate panel joints so that trimmed panels at corners are not less than 12 inches (300 mm) wide.
 - 1. Mark plumb lines on substrate at panel joint locations for accurate installation.
 - 2. Locate panel joints to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

- A. Install plastic paneling according to manufacturer's written instructions.
- B. Install panels with fasteners. Layout fastener locations and mark on face of panels so that fasteners are accurately aligned.
 - 1. Drill oversized fastener holes in panels and center fasteners in holes.
 - 2. Apply sealant to fastener holes before installing fasteners.
- C. Install trim accessories with adhesive.
- D. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.
- E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.
- F. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.
- G. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 066400

SECTION 071113 - BITUMINOUS DAMPPROOFING

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. Cold-applied, cut-back-asphalt dampproofing.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for bituminous vapor retarders.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 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 molded-sheet drainage panels and auxiliary materials recommended in writing by manufacturer of primary materials.
- B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.2 COLD-APPLIED, CUT-BACK-ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. BASF Construction Chemicals - Construction Systems.
 - 2. ChemMasters, Inc.
 - 3. Euclid Chemical Company (The); an RPM company.
 - 4. Henry Company.
 - 5. Karnak Corporation.
 - 6. Koppers Inc.
 - 7. W.R. Meadows, Inc.
- B. Trowel Coats: ASTM D 4586, Type I, Class 1, fibered.
- C. Brush and Spray Coats: ASTM D 4479, Type I, fibered or nonfibered.

2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Cut-Back-Asphalt Primer: ASTM D 41.
- C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
- D. Patching Compound: Epoxy or latex-modified repair mortar of type recommended in writing by dampproofing manufacturer.
- E. Protection Course: ASTM D 6506, 1/8-inch- (3-mm-) thick, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.

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.
 - 3. Allow 24 hours drying time prior to backfilling.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches (150 mm) over outside face of footing.
 - 1. Extend dampproofing 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- (200-mm-) wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
- C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch (6 mm) 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 (6 mm) onto shelf angles supporting veneer.

3.4 COLD-APPLIED, CUT-BACK-ASPHALT DAMPPROOFING

- A. Unparged Masonry Foundation Walls: Apply primer and two brush or spray coats at not less than 1.25 gal./100 sq.ft. (0.5 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat or primer and one trowel coat at not less than 4 gal./100 sq. ft. (1.6 L/sq. m).

3.5 INSTALLATION OF PROTECTION COURSE

- A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.
 - 1. Support protection course over cured coating with spot application of adhesive type recommended in writing by protection-board manufacturer.
 - 2. Install protection course within 24 hours of installation of dampproofing (while coating is tacky) to ensure adhesion.

3.6 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

SECTION 071413 - HOT FLUID-APPLIED RUBBERIZED ASPHALT WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Rubberized-asphalt waterproofing membrane, reinforced.
2. Molded-sheet drainage panels.
3. Insulation.
4. Plaza-deck pavers supported on pedestals.

- B. Related Requirements:

1. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 PREINSTALLATION MEETINGS

- A. 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 ACTION SUBMITTALS

- A. Product Data: For each type of product. 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 to adjoining waterproofing, and other termination conditions.

1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported plaza deck pavers.

- C. Samples: For plaza-deck pavers, full sized in each color and texture required.

1.5 INFORMATION SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.
- C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Mockups: Install waterproofing to 100 sq. ft. (9.3 sq. m) of deck to demonstrate surface preparation, crack and joint treatment, corner treatment, thickness, texture, and execution quality. Install pavers and paver supports to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.
- B. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- C. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

- A. Weather 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, or when temperature is below zero deg F (minus 18 deg C).
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace waterproofing and sheet flashings that do not comply with requirements or that fail to remain watertight within specified warranty period.

1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pedestal-mounted pavers on plaza decks.
 2. Warranty insulation retains 80 percent of original published thermal value.
 3. Warranty pavers do not dish or warp and do not crack, split, or disintegrate in freeze-thaw conditions.
 4. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Installer's Warranty: Specified form signed by Installer, covering Work of this Section, for warranty period of two years.
1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pedestal-mounted pavers on plaza decks.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain waterproofing materials, sheet flashings, protection course, molded-sheet drainage panels, insulation, pavers and pedestals from single source from single manufacturer.

2.2 WATERPROOFING MEMBRANE

- A. Hot Fluid-Applied, Rubberized-Asphalt Waterproofing Membrane: Single component; 100 percent solids; hot fluid-applied, rubberized asphalt.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Hydrotech, Inc; Monolithic Membrane 6125.
 - b. Barrett Company; Ram-Tough 250.
 - c. Carlisle Coatings & Waterproofing Inc; CCW-500R.
 - d. Henry Company; 790-11.
 - e. Soprema, Inc.
 - f. Tamko Building Products, Inc; TW-Hot Melt.
 - g. Tremco Incorporated; Tremproof 150.

2.3 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with waterproofing.
- B. Primer: ASTM D 41/D 41M, asphaltic primer.
- C. Elastomeric Sheet: 50-mil- (1.3-mm-) minimum, uncured sheet neoprene with manufacturer's recommended contact adhesives as follows:
1. Tensile Strength: 1400 psi (9.6 MPa) minimum; ASTM D 412, Die C.
 2. Elongation: 300 percent minimum; ASTM D 412.

3. Tear Resistance: 125 psi (860 kPa) minimum; ASTM D 624, Die C.
 4. Brittleness: Does not break at minus 30 deg F (34 deg C); ASTM D 2137.
- D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum termination bars; approximately 1 by 1/8 inch (25 by 3 mm) thick; with stainless-steel anchors.
- E. Sealants and Accessories: Manufacturer's recommended sealants and accessories.
- F. Reinforcing Fabric: Manufacturer's recommended, spun-bonded polyester fabric.
- G. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
1. Thickness: 1/8 inch (3 mm), nominal, for vertical applications; 1/4 inch (6 mm), nominal, elsewhere.
- H. Protection Course: Manufacturer's standard, 80- to 90-mil- (2.0- to 2.3-mm-) thick, fiberglass-reinforced rubberized asphalt or modified bituminous sheet.

2.4 MOLDED-SHEET DRAINAGE PANELS

- A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve, laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm/ft. (112 to 188 L/min. per m).

2.5 INSULATION

- A. Board Insulation: Extruded-polystyrene board insulation complying with ASTM C 578, Type VII, 60-psi (173-kPa) minimum compressive resistance, square edged. Thickness, as indicated on the Drawngs.
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.
 - d. Pactiv Corporation.
 - e. T. Clear Corporation.

2.6 PLAZA-DECK PAVERS

- A. Products: Subject to compliance with requirements, provide one of the following or approved equal:
1. American Hydrotech, Inc.
 2. Bison Innovative Products.

- B. Thickness: 1-3/4 inches (41 mm).
- C. Material: Architectural concrete pavers.
- D. Face Size: 24 inches (610 mm) square
- E. Fire Rating: Class A. Must exceed ASTM E108-07a flame spread test.
- F. Color: Basis-of-Design product from American Hydrotech, Inc.; Natural.
- G. Paver Supports: Paver manufacturer's standard SBR rubber, high-density polyethylene, or polyurethane paver support assembly, including adjustable pedestals, shims, and spacer tabs for joint spacing of 1/8 inch (3 mm).

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.
 - 1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
 - 2. Verify that 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 and prepare substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.
- D. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
 - 1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.

- E. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, and other voids.

3.3 JOINTS, CRACKS, AND TERMINATIONS

- A. Prepare and treat substrates to receive waterproofing membrane, including joints and cracks, deck drains, corners, and penetrations according to manufacturer's written instructions.
 - 1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D 4258.
 - 2. Adhere strip of elastomeric sheet to substrate in a layer of hot rubberized asphalt. Extend elastomeric sheet a minimum of 6 inches (150 mm) on each side of moving joints and cracks or joints and cracks exceeding 1/8 inch (3 mm) thick, and beyond deck drains and penetrations. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.
 - 3. Embed strip of reinforcing fabric into a layer of hot rubberized asphalt. Extend reinforcing fabric a minimum of 6 inches (150 mm) on each side of nonmoving joints and cracks not exceeding 1/8 inch (3 mm) thick, and beyond roof drains and penetrations.
 - a. Apply second layer of hot fluid-applied, rubberized asphalt over reinforcing fabric.
- B. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge joints with elastomeric sheet extended a minimum of 6 inches (150 mm) on each side of joints and adhere to substrates in a layer of hot rubberized asphalt. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.

3.4 FLASHING INSTALLATION

- A. Install elastomeric sheets at terminations of waterproofing membrane according to manufacturer's written instructions.
- B. Prime substrate with asphalt primer.
- C. Install elastomeric sheet and adhere to deck and wall substrates in a layer of hot rubberized asphalt.
- D. Extend elastomeric sheet up walls or parapets a minimum of 8 inches (200 mm) above plaza-deck pavers and 6 inches (150 mm) onto deck to be waterproofed.
- E. Install termination bars and mechanically fasten to top of elastomeric flashing sheet at terminations and perimeter of waterproofing.

3.5 MEMBRANE APPLICATION

- A. Apply primer, at manufacturer's recommended rate, over prepared substrate and allow it to dry.
- B. Heat and apply rubberized asphalt according to manufacturer's written instructions.

1. Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator specifically designed for heating rubberized asphalt.
- C. Start application with manufacturer's authorized representative present.
- D. Reinforced Membrane: Apply hot rubberized asphalt to substrates and adjoining surfaces indicated. Spread to a thickness of 90 mils (2.3 mm); embed reinforcing fabric, overlapping sheets 2 inches (50 mm); spread another 125-mil- (3.2-mm-) thick layer to provide a uniform, reinforced, seamless membrane 215 mils (5.5 mm) thick.
- E. Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.
- F. Cover waterproofing with protection course with overlapped joints before membrane is subject to construction or traffic.

3.6 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate according to manufacturer's written instructions. Use methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.7 INSULATION INSTALLATION

- A. Install one or more layers of board insulation to achieve required thickness and insulation drainage panels over waterproofed surfaces. Cut and fit to within 3/4 inch (19 mm) of projections and penetrations.
- B. On vertical surfaces, set insulation units into rubberized asphalt according to manufacturer's written instructions.
- C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.8 PLAZA-DECK PAVER INSTALLATION

- A. Install plaza deck pavers according to manufacturer's written instructions.
- B. Accurately install adjustable-height paver pedestals and accessories to elevations required. Adjust for final level and slope with shims.
 1. Fill paver pedestal with concrete mix, strike smooth with top of pedestal, and cure according to ACI 301.
- C. Loosely lay pavers on pedestals, maintaining a uniform open joint width. Tightly seat pavers against spacers to eliminate lateral movement or drift of paving assembly. Align joint patterns parallel in each direction.

1. Lay out pavers to avoid less-than-half-width pavers at perimeter or other terminations.
- D. Install pavers to not vary more than 1/16 inch (1.6 mm) in elevation between adjacent pavers or more than 1/16 inch (1.6 mm) from surface plane elevation of individual paver.
- E. Limit variation in paving installation to within 1/4 inch in 10 feet (6 mm in 3 m) of surface plane in any direction; noncumulative.

3.9 FIELD QUALITY CONTROL

- A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; and application of membrane, flashings, protection, and drainage components; furnish daily reports to Architect.
 1. Site representative shall measure membrane thickness with pin tester or other suitable device at least once for every 100 sq. ft. (10 sq. m) and include measurements in reports.
- B. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, waterproofing application, protection, and drainage components, and to furnish reports to Architect.
 1. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after completing and protecting waterproofing but before overlaying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water. Testing agency shall observe flood testing.
 - a. Flood to an average depth of 2-1/2 inches (65 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (50 mm) of clearance from top of sheet flashings.
 - b. Flood each area for 24 hours.
 - c. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.
 2. Electric Field Vector Mapping (EFVM): Testing agency shall survey entire waterproofing area for potential leaks using EFVM.

3.10 CLEANING AND PROTECTION

- A. Protect waterproofing from damage and wear during remainder of construction period.
- B. Protect installed board insulation and insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071413

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Extruded polystyrene foam-plastic board.
2. Mineral-wool board (semi-rigid) insulation.
3. Glass-fiber blanket insulation.
4. Spray polyurethane foam insulation.
5. Z-furring used in association with rigid insulation.

- B. Related Requirements:

1. Section 042000 "Unit Masonry" for insulation installed in masonry cells.
2. Section 074213.13 "Comprehensive Rainscreen Assembly" for the mineral-wool board (semi-rigid) insulation and vented hat channels at contractor's option.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 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 until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Extruded-Polystyrene Board Insulation: Rigid, cellular polystyrene thermal insulation formed from polystyrene base resin by an extrusion process using hydrochlorofluorocarbons as blowing agent to comply with ASTM C 578 for type and with other requirements indicated below:
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, 1.60-lb/cu. ft. (26-kg/cu. m) minimum density, unless otherwise indicated.
 3. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 75 and 450, respectively.
 4. Foundation wall perimeter insulation shall be 2 inches thick, unless noted otherwise.
- B. Expanded Polystyrene Foam-Plastic Foam Insulation at contractor's option.

2.2 MINERAL-WOOL BOARD/SEMI-RIGID INSULATION

- A. Basis of Design Product: Subject to compliance with requirements, provide Roxul, Inc.; Cavityrock DD rigid insulation board, or equal, and as follows:
1. ASTM C 612, Type IVB.
 2. ASTM E 84 flame spread, and smoke developed indexes of zero.
 3. Density: Outer layer 6.2 lb/s.f., inner layer 4.1 lb/s.f.
 4. Thickness: 3 inches.
- B. Spray or Roll Applied Coating: Provided spray or roll applied coating on mineral-wool board/semi-rigid insulation where fiber reinforced cementitious wall panels are installed only. Refer to Drawings for location.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning; All Guard.
 - b. Dow Corning; Defend Air 200.
 - c. Prosoco; R-Guard Cat 5 Rain Screen.
 - d. Momentive; SEC2600 SilShield AWB.
 2. Color: Black.

3. Installation: Per manufacturer's recommendation for use over mineral-wool board/semi-rigid insulation.

2.3 GLASS-FIBER BLANKET

- A. Glass-Fiber Blanket, Unfaced: 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. Guardian Fiberglass, Inc.
 - c. Johns Manville.
 - d. Knauf Fiber Glass.
 - e. Owens Corning.

2.4 SPRAY POLYURETHANE FOAM INSULATION

- A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation.
 - b. BaySystems NorthAmerica, LLC.
 - c. Dow Chemical Company (The).
 - d. ERSystems, Inc.
 - e. Gaco Western Inc.
 - f. Henry Company.
 - g. NCFI; Division of Barnhardt Mfg. Co.
 - h. SWD Urethane Company.
 - i. Volatile Free, Inc.
 2. Minimum density of 1.5 lb/cu. ft. (24 kg/cu. m), thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F (43 K x m/W at 24 deg C).

2.5 INSULATION FASTENERS

- A. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. AGM Industries, Inc.; RC150.
 - b. AGM Industries, Inc.; SC150.

- c. Gemco; Dome-Cap.
 - d. Gemco; R-150.
 - e. Gemco; S-150.
2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
- a. Where indicated.

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 compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.7 Z-FURRING FOR RIGID INSULATION

A. Polyester and vinyl ester bioresin matrix with recycled materials, fire retardant additives and integral continuous metal inserts the length of profile. Reinforce Z-furring girts with glass strand rovings used internally for longitudinal strength and continuous strand glass mats or stitched reinforcements used internally for transverse strength.

1. Products: Subject to compliance with requirements, provide the following:
 - a. Advanced Architectural Products (A2P), SMART ci 2-in-1 System.
2. Girt Depth: 2 inches to match rigid insulation thickness.
3. Spacing: 16 inches on center.
4. Provide manufacturer's standard continuous 16-gauge galvanized steel continuous insert for engagement of fasteners into metal framing.
5. Provide manufacturer's standard integral three-point compression seal to prevent insulation panels from dislodging.
6. Provide manufacturer's standard integral anti-siphon grooves on exterior and interior flanges of girt members.
7. Provide manufacturer's standard spline seals for adjacent insulation units into profile of girt members.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
 - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
 - 2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
 - 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
 - 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.5 INSTALLATION OF Z-FURRING

- A. Install Z-furring girts in accordance with manufacturer's written installation instructions in conjunction with rigid insulation.
- B. Do not overtighten screw fasteners to avoid crushing sheathing and damaging air barrier membrane.
- C. Install Z-furring girts to fill in exterior continuous insulation spaces without gaps or voids. Do not compress insulation panels.
- D. Trim insulation neatly to fit spaces and insulate miscellaneous gaps and voids.
- E. Seal gaps, voids or penetrations with expandable foam sealant on exterior side of insulation.

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

SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Vapor-retarding, fluid-applied air barriers.
2. Vapor-permeable, fluid-applied air barriers.

- B. Related Requirements:

1. Section 042000 "Unit Masonry" for embedded flashings.
2. Section 061600 "Sheathing" for substrates over which air barriers are applied.
3. Section 076200 "Sheet Metal Flashing and Trim" for sheet metal flashings.
4. Section 079200 "Joint Sealants" for joint-sealant materials and installation.
5. Section 074213.13 "Comprehensive Rainscreen Assembly" for the vapor-permeable, fluid-applied air barriers at contractor's option.

1.3 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

- B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
- B. Mockups: Before beginning installation of air barrier, build mockup of exterior wall assembly, reference Specification Section 042000 for size of mockup, 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, terminations, and penetrations of air barrier membrane.
 1. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
 2. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
- C. Preinstallation Conference: Conduct conference at Project site with manufacturer's authorized field representative.
 1. Include installers of other construction 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. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
 - 1. Protect substrates from environmental conditions that affect air-barrier performance.
 - 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested according to ASTM E 2357.

2.3 FLUID-APPLIED MEMBRANE AIR BARRIER

- A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Elastomeric, Modified Bituminous Membrane:
 - 1) Carlisle Coatings & Waterproofing; Barriseal.
 - 2) Henry Company; Air-Block 06.
 - 3) Tremco Incorporated; ExoAAir 120.
 - 4) TK Products; AirMax 2102 NP.
 - b. Synthetic Polymer Membrane:

- 1) Grace, W.R. & Co.; Perm-A-Barrier Liquid.
- 2) Henry Company; Air-Bloc 21.
- 3) Meadows, W. R., Inc.; Sealtight Air-Shield LM.
- 4) Sto Corp; Vapor Seal.
- 5) BASF Corporation; Enershield-I.
- 6) 6) Carlisle Coating & Waterproofing; Barritech NP

2. Physical and Performance Properties:

- a. Membrane Vapor Permeance: Not to exceed 0.1 perm (5.8 ng/Pa x s x sq. m); ASTM E 96.
- b. Membrane Air Permeance: Not to exceed 0.004 cfm x sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa.) pressure difference; ASTM E 2178.

B. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Elastomeric, Modified Bituminous Membrane:

- 1) Henry Company; Air-Block 07.
- 2) Meadows, W.R., Inc.; Sealtight Air-Shield LMP.
- 3) Tremco; ExoAir 220.
- 4) TK Products; AirMax 2103 N WB.

b. Synthetic Polymer Membrane:

- 1) Carlisle Coatings & Waterproofing; Barritech VP.
- 2) Grace; Perm-A-Barrier VP.
- 3) Henry Company; Air-Bloc 31.
- 4) ProSoCo, Inc.; R-Guard.
- 5) Sto Corp; Emerald Coat.
- 6) BASF Corporation; Enershield-HP.

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. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
- b. Membrane Vapor Permeance: Not less than 10 perms (580 ng/Pa x s x sq. m); ASTM E 96.

2.4 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. Counterflashing Strip: Modified bituminous, 40-mil- (1.0-mm-) thick, self-adhering sheet consisting of 32 mils (0.8 mm) of rubberized asphalt laminated to an 8-mil- (0.2-mm-) thick, crosslaminated polyethylene film with release liner backing.
- D. Butyl Strip: Vapor-retarding, 30- to 40-mil- (0.76- to 1.0-mm-) thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.
- E. Joint Reinforcing Strip: Air barrier manufacturer's glass-fiber-mesh tape.
- F. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- G. Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- H. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft (24 to 32 kg/cu. m) density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- I. Modified Bituminous Transition Strip: Vapor-retarding, 40-mil- (1.0-mm-) thick, smooth-surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.
- J. Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil- (0.43-mm-) thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance of 37 perms (2145 ng/Pa x s x sq. m).
- K. 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."
- L. EPDM Vapor Retarder with Semi-Rigid Insulation: 0.040-inch ethylene-propylene-diene terpolymer per ASTM D4637 with stainless-steel termination bars, filled with 4 lb/c.ft. density, Type IVB mineral wool.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.

3. Verify that substrates are visibly dry and free of moisture.
 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. 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 material.
- 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.
- H. Bridge isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

- A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 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. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.
 3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
- B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and

window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

- C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- D. 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.
- E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip or preformed silicone extrusion so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.
 - 1. Transition Strip: Roll firmly to enhance adhesion.
 - 2. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.
- F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- H. Seal top of through-wall flashings to air barrier with an additional 6-inch- (150-mm-) wide, transition strip.
- I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.4 AIR BARRIER MEMBRANE INSTALLATION

- A. Apply air barrier membrane to form a seal with strips and transition strips and to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
- B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.
- C. 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.
- D. 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-Retarding Membrane Air Barrier: 60-mil (1.5-mm) dry film thickness.

- a. Apply to concrete masonry substrates.
2. Vapor-Permeable Membrane Air Barrier: Dry film thickness recommended by manufacturer.
 - a. Apply to metal-framed and sheathed substrates.
- E. Apply strip and transition strip a minimum of 1 inch (25 mm) onto cured air membrane or strip and transition strip over cured air membrane overlapping 3 inches (75 mm) onto each surface according to air barrier manufacturer's written instructions.
- F. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.
- G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's authorized field representatives to conduct an inspection of completed membrane air barrier assembly and submit report to Architect. Deficiencies shall be remedied by applicator prior to cladding with exterior facing materials.
- B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 2. Air-barrier dry film thickness.
 3. Continuous structural support of air-barrier system has been provided.
 4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 5. Site conditions for application temperature and dryness of substrates have been maintained.
 6. Maximum exposure time of materials to UV deterioration has not been exceeded.
 7. Surfaces have been primed, if applicable.
 8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
 9. Termination mastic has been applied on cut edges.
 10. Strips and transition strips have been firmly adhered to substrate.
 11. Compatible materials have been used.
 12. Transitions at changes in direction and structural support at gaps have been provided.
 13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 14. All penetrations have been sealed.
- C. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
 2. Remove and replace deficient air-barrier components for retesting as specified above.
- D. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- E. Prepare test and inspection reports.

3.6 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 recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.
- C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 074160 – FIBER-REINFORCED CEMENTITIOUS WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes fiber-reinforced cementitious wall panels including the following:
 - 1. Fiber cement/concrete panels.
 - 2. Fasteners
 - 3. Sheet metal flashing and trim.
 - 4. Accessories.
- B. Related Sections include the following:
 - 1. Section 072100 “Thermal Insulation” for the Z-furring at contractor’s option.
 - 2. Section 074213.13 “Comprehensive Rainscreen Assembly” for the vented hat channels at contractor’s option.

1.3 REFERENCES

- A. American Society of Testing and Materials (ASTM):
 - 1. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM C 1186 Standard Specification for Flat Non-Asbestos Fiber-Cement Sheets.
 - 3. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 4. ASTM E 228 Standard Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer (Withdrawn 2005)
 - 5. ASTM G 155 Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.

1.4 DEFINITIONS

- A. Fiber Cement Panel Assembly: Fiber-reinforced cementitious wall panels, fasteners, and accessories.

1.5 PERFORMANCE REQUIREMENTS

- A. General: Provide wall panels that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.
- B. Design wall panels, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Performance: Provide wall panels 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 330.
 - 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure of 30 psf acting inward or outward.
 - 2. Deflection limits: Wall panels shall withstand wind loads with horizontal deflections no greater than 1/300 of the span anywhere in the panel.
- D. Thermal Movements: Provide wall 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): -40 deg F up to 176 deg F.
- E. Panel to framing fastener spacing shall be calculated when support system is designed. Support system shall be capable of supporting system in accordance with requirements of this section and those of good engineering practice.

1.6 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 wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory and field-assembled work. Show complete building elevation with all panels and joints completely dimensioned.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Include details of furring at a scale of not less than 1-1/2 inches per foot.
- C. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:

1. Wall panels and attachments.
 2. Girts and stud framing.
 3. Wall-mounted items including doors, windows, louvers and lighting fixtures.
 4. Fire alarm notification devices.
 5. Penetrations of walls by pipes and utilities and service items/connections.
- D. Samples for Verification: For each type of exposed finish required, prepared on samples of size indicated below.
1. Wall Panels: 12 inches long by actual panel width. Include fasteners, closures, and other 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.
- E. Qualification Data: For Installer and professional engineer.
- F. Material Certificates: Signed by manufacturers.
- G. Field quality-control test reports.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following:
1. Wall Panels: Include reports for air fire-test-response characteristics and structural performance.
- I. Maintenance Data: For wall panels to include in maintenance manuals.
- J. Warranties: Special warranties specified in this Section.
- 1.7 QUALITY ASSURANCE
- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
1. Installer's responsibilities include fabricating and installing wall panels and providing professional engineering service needed to assume engineering responsibility.
 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Source Limitations: Obtain each type of wall panel through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of wall panels and are based on the specific system indicated.
1. Do not modify intended aesthetic affects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

- D. Surface-Burning Characteristics: Provide wall panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. Flame-Spread Index: 25 or less, unless otherwise indicated.
 2. Smoke-Developed Index: 450 or less, unless otherwise indicated.
- E. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
1. Build mockup of typical corner wall panel as shown on visual and technical test mockup Drawing; by full thickness, including supports, attachments, and accessories.
 2. Include four-way joint for fiber cement wall panels
 3. Approval of mockups is for other material and construction qualities specifically approved by Architect in writing.
 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
 5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Preinstallation Conference: Conduct conference at jobsite. Review methods and procedures related to wall panel assemblies including, but not limited to, the following:
1. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 2. Review flashings, penetrations, openings, etc. that will affect wall panels.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, wall panels, and other manufactured items so as not to be damaged or deformed. Package wall panels for protection during transportation and handling.
- B. Unload, store, and erect wall panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack fiber cement panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store wall panels inside to ensure dryness. Do not store wall panels in contact with other materials that might cause staining, denting, or other surface damage.

1.9 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of 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 wall panel fabrication and indicate measurements on Shop Drawings.

1.10 COORDINATION

- A. Coordinate wall panel assemblies with rain drainage work, flashing, trim, and construction of girts, studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Panel Warranty: Form is included at the end of this section in which installer agrees to repair or replace components of exterior enclosure systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.

- 1. Failures include, but are not limited to, the following:

- a. Structural failures including, but not limited to, excessive deflection.
- b. Noise or vibration caused by thermal movements.
- c. Failure of panels to meet performance requirements.
- d. Deterioration of panels, panel finishes, and other materials beyond normal weathering.
- e. Corrosion of fasteners.

- 2. Warranty Period: Ten (10) years from date of Substantial Completion.

- B. Panel Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of wall panels that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:

- a. Structural failures, including rupturing, cracking, or puncturing.
- b. Deterioration of finishes, and other materials beyond normal weathering.

- 2. Warranty Period:

- a. Ten (10) years from date of Substantial Completion for fiber cement panels and support system.

- C. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1.12 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. Fiber Cement Panels: 5% of each type/color, in unbroken bundles.
- 2. Fasteners: 5% of each type/color

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

- A. Fiber-Cement Panels: Provide wall panels factory-fabricated from single sheets and cut into shapes and sizes and drilled for installation method indicated. Include attachment system components and accessories required for system.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Fiber Cement Corp.; Natura TC.
 - b. Swisspearl; Carat.
 2. Panel Material: Cement, silicon-calcium strengthened with a combination polyvinyl and cellulose fibers without asbestos, fiberglass or formaldehyde complying with ASTM C 1186, Type A, Grade III. Panels reinforced with only cellulose fibers will not be accepted.
 3. Fire Resistive Rating: noncombustible, UBC Class 1, NFPA Class A, per ASTM E 136 (VTEC Lab. NY).
 4. Panels shall be classified as noncombustible when tested according to ASTM E 136; and has a flame-spread index of 25 or less when tested according to ASTM E 84.
 5. Freeze Thaw Resistance: At least 80 percent flexural strength retained, when tested in accordance with ASTM C 1185.
 6. UV Resistance: No cracking, checking, or erosion, where tested for 2000 hours in accordance with ASTM G 155.
 7. Thickness: 8 mm (5/16 inch).
 8. Colors:
 - a. CWP-1: American Fiber Cement; Cembrit Solid Mercury S 030.
 9. Reflex-finished panels to be manufactured in one run and oriented all alike.
- B. Panel Sealants:
1. Do not use sealants where they will contact fiber cement panels.
- C. Attachment System Components: Formed from stainless steel or extruded aluminum.
1. Include insect screens; inside and outside backer angle plates; as recommended by fiber cement panel manufacturer.
 2. Alignment Pins: Stainless steel.
- D. Flashing and Trim: As specified in Section 076200 "Sheet Metal Flashing and Trim."

2.2 FASTENERS

- A. Panel fastening shall be designed and engineered by Contractor to meet performance requirements as stated in these specifications and on the Drawings.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide manufacturer's exposed fasteners with heads matching color of wall panels by means of factory-applied coating.
 - 1. Fasteners for Wall Panels: Flat-profile, self-drilling or self-tapping 410 stainless steel rivets, with EPDM or PVC washer under heads of fasteners bearing on weather side of wall panels, prefinished to match panel color.

2.4 ACCESSORIES

- A. Wall Panel Accessories: Provide outside and inside corner metal backer plates as recommended by the panel's manufacturer.
- B. Spray or Roll Applied Coating: Provided spray or roll applied coating on attachment system components where for fiber reinforced cementitious wall panels that are exposed to view between the rainscreen joint system. Refer to Drawings for location.
 - 1. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning; All Guard.
 - b. Dow Corning; Defend Air 200.
 - c. Prosoco; R-Guard Cat 5 Rain Screen.
 - d. Momentive; SEC2600 SilShield AWB.
 - 2. Color: Black.
 - 3. Installation: Per manufacturer's recommendation for use over the attachment system components.

2.5 FABRICATION

- A. General: Fabricate and finish wall 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.
 - 1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
 - 2. Fabricate wall panels with panel stiffeners as required to maintain fabrication tolerances and to withstand design loads.
 - 3. Fabrication includes drilling holes for fasteners and other penetrations.
- B. Fiber Cement Wall Panels: Fabricate panels with panel stiffeners as required to comply with deflection limits. Corners shall be smooth. Fabricate panels to the following dimensional tolerances:
 - 1. Length and Width: Plus or minus 0.032 inch up to 48 inches; 0.064 inch more than 48 inches.

2. Diagonal: Plus or minus 0.1875 inch
3. Panel Bow: not more than 0.2 percent of panel width or length up to 0.1875 inch maximum.
4. Thickness: Plus or minus 0.008 inch
5. Squareness: 0.1875-inch difference between diagonal measurements
6. Camber: 0.032 inch

2.6 FINISHES, GENERAL

- A. Protect 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 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.
- C. Paint all corner backer plates, and all materials that will be visible between panel joints, flat black.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, wall panel supports, and other conditions affecting performance of work.
 1. Examine primary and secondary 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. 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 wall panels to verify actual locations of penetrations relative to seam locations of wall panels before wall panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to materials.
- B. Install flashings and other sheet metal to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

- C. Install fasciae and copings to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.3 PANEL INSTALLATION, GENERAL

- A. General: Install wall panels in orientation, sizes, and locations indicated on Drawings. Install panels to girts and subgirts provided as specified in Division 07 Section "Thermal Insulation". Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement. All cutting, drilling and sealing of fiber cement panels shall be executed as indicated in manufacturer's written installation instructions.
 - 1. Field cutting of wall panels by torch is not permitted.
 - 2. Shim or otherwise plumb substrates receiving wall panels.
 - 3. Do not begin installation until weather barrier underlayment and flashings that will be concealed by wall panels are installed.
 - 4. Install screw fasteners in predrilled holes.
- B. Fasteners:
 - 1. Fiber Cement Wall Panels: Pre-finished Stainless Steel.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by wall panel manufacturer.

3.4 WALL PANEL INSTALLATION

- A. Back Ventilated Rainscreen-Principle Installation:
 - 1. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
 - 2. Do not apply sealants to joints, unless otherwise indicated on Drawings.

3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate with other components.
- B. Flashing and Trim: Comply with SMACNA and manufacturer's written installation instructions. Provide concealed fasteners. Install work with laps, joints, and seams that will be permanently watertight and weather resistant. Provide for thermal expansion.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align wall panel units within installed tolerance of 1/4 inch in 20 feet, noncumulative, on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 FIELD QUALITY CONTROL

- A. Remove and replace applications of wall panels where inspections indicated that they do not comply with specified requirements.
- B. Final Wall Panel Inspection: Arrange for wall panel system manufacturer's factor-authorized representative to inspect wall panel installation on completion and submit report to Architect.
 - 1. Notify Architect and Owner 48 hours in advance of date and time of inspection.
- C. Repair or remove and replace components of wall panel system where inspections indicate that they do not comply with specified requirements.
- D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 CLEAN AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of wall panel installation, clean finished surfaces as recommended by wall panel manufacturer. Maintain in a clean condition during construction.
- B. Replace wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.9 EXTERIOR ENCLOSURE INSTALLER'S AND MANUFACTURER'S WARRANTY

- A. WHEREAS (Name)_____ of (Address)_____, herein called the "Enclosure Installer," has performed roofing and associated work ("work") on the following project:
 - 1. Owner:_____
 - 2. Address:_____
 - 3. Building Name/Type:_____
 - 4. Address:_____
 - 5. Area of Work:_____
 - 6. Acceptance Date:_____
 - 7. Warranty Period:_____
 - 8. Expiration Date:_____
- B. AND WHEREAS Enclosure Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Enclosure Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be

made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning;
 - b. peak gust wind speed exceeding 75 mph;
 - c. fire;
 - d. failure of panel system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on bottom of roofing; and
 - g. activity on exterior enclosure by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Enclosure Installer and until cost and expense thereof has been paid by Owner or by another responsible party so designated.
3. The Enclosure Installer is responsible for damage to work covered by this Warranty and is liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work. Remedial work shall be performed within a 24-hour period following notification.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Enclosure Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on enclosure, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Enclosure Installer to perform said alterations, Warranty shall not become null and void, unless Enclosure Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of enclosure is changed and it becomes used for other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. The Owner shall promptly notify Enclosure Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Enclosure Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Enclosure Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of enclosure failure. Specifically, this Warranty shall not operate to relieve Enclosure Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this ___ day of
(month)_____20__.

1. Authorized Signature:
2. Name:
3. Title:

END OF SECTION 074160

SECTION 074213 - METAL WALL PANELS AND SOFFIT PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Concealed-fastener, lap-seam pre-formed metal wall panels.
- 2. Metal soffit panels with concealed fasteners.

- B. Related Sections:

- 1. Section 072100 "Thermal Insulation" for mineral-wool board (semi-rigid) insulation and Z-furring at contractor's option.
- 2. Section 072726 "Fluid-Applied Membrane Air Barriers" for continuous air barrier systems at contractor's option.
- 3. Section 076200 "Sheet Metal Flashing and Trim" for flashing and other sheet metal work that is not part of metal wall panel assemblies.
- 4. Section 074213.13 "Comprehensive Rainscreen Assembly" for metal wall panels at contractor's option.

1.3 DEFINITION

- A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight wall system.

1.4 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. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) 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. (75 Pa).
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- D. Water Penetration under Dynamic Pressure: No evidence of water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. (300 Pa) and not more than 12 lbf/sq. ft. (575 Pa).
 1. Water Leakage: Uncontrolled water infiltrating the system or appearing on system's normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.
- 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each 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.
 1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):
 - a. Flashing and trim.
 - b. Anchorage systems.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Wall and Soffit Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal wall panel accessories.
2. Trim and Closures: 12 inches (305 mm) long. Include fasteners and other exposed accessories.
3. Accessories: 12-inch- (305-mm-) long Samples for each type of accessory.

D. Qualification Data: For Installer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

F. Maintenance Data: For metal wall panels to include in maintenance manuals.

G. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each type of metal wall panel from single source from single manufacturer.

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 girts, studs, 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 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: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall 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 PANEL MATERIALS

- A. Pre-Painted, Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A755/A755M.
 - 1. Surface: Smooth, flat finish.
 - 2. Exposed Coil-Coated Finish:
 - a. Mica Fluoropolymer: AAMA 621. 2-coat fluoropolymer finish with suspended mica flakes 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 (MWP-1): Basis-of-design color is Metal Design Systems, Inc.; Apolic, MTLC PEX Pewter.

3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
- B. Refer to Section 072100 "Thermal Insulation."

2.2 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.

2.3 METAL WALL PANELS (MWP-1)

- A. General: Provide factory-formed metal panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats and accessories required for weathertight installation.
1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Vertical-Rib, Standing-Seam Metal Wall Panels: Formed with smooth, flat panels between panel edges, designed for sequential installation by mechanically attaching panels to supports using concealed clips located over the male side of one panel and under the female side of the opposite panel, and mechanically seaming panels 180°.
1. Basis-of-Design System: Panel shall be IMETCO TwinLok 1.5 (TL 1.5) wall panel system as manufactured by Innovative Metals Company, Inc. (IMETCO), Norcross, Georgia, telephone 1-678-656-1265 or pre-approved product by one of the following:
 - a. Berridge Manufacturing.
 - b. Centria Architectural Systems.
 - c. Morin, a Kingspan Group Company.
 - d. Metal Sales Manufacturing Corp.
 2. Material: Zinc-coated (galvanized) steel sheet, 22-gauge nominal thickness.
 3. Characteristics:
 - a. The same panel profile from a single manufacturer shall be used for ALL standing seam areas.
 - b. Configuration: Interlocking standing seams incorporating concealed anchor clips allowing thermal movement. Snap-on separate seam caps are not acceptable.
 - 1) Profile of panel shall be smooth throughout the flat portion on the panel.
 - 2) Exposed fasteners, screws and/or roof mastic are unacceptable and will be rejected. System configuration only allows for exposed fasteners at panel

- overlap (if required and approved) and trim details (as per manufacturer's guidelines).
- 3) Panels must be furnished in continuous lengths with no overlaps, unless shown on contract documents.
- c. Seam: 1.5 inch (38 mm) minimum height. Seam shall allow for expansion and contraction of panels due to thermal changes.
 - d. Sealant: Female seam shall have a factory applied hot melt sealant bead. Clip shall be designed to insure that normal expansion and contraction of panel will not cause damage to the integrity of the seal.
 - e. A clearance of 7/16 inch (11 mm) high between the panel and the roof substrate is required to conceal telegraphing of the supporting structure and to aid in venting the roof system.
 - f. Site Formed Panels: Bidder will not be allowed to supply panels formed at the job-site on portable roll formers; metal panels must be factory pre-manufactured and engineered for this project.
 - g. Concealed Standard Anchor Clips: Clips base must be 18 gauge (1.2 mm) galvanized steel with 22 gauge (0.7 mm) galvanized steel sliding top. Clips must be two (2) piece design to provide for a minimum of three (3) inches of total thermal movement in the longitudinal dimension. One-piece clips are NOT acceptable.
 - h. Standing Seam Panel Width: 12-inch (nominal).

2.4 METAL 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 accessories required for weathertight installation.
- B. Flush-Profile Metal Soffit Panels: Solid panels formed with vertical panel edges and flat pan between panel edges; with flush joint between panels.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal Sales Manufacturing Corp.; Soffit Panel or comparable product by one of the following:
 - a. Berridge Manufacturing.
 - b. Centria Architectural Systems.
 - c. IMETCO, Inc.
 - d. Morin, a Kingspan Group Company.
 2. Panel Coverage: 12 inches (305 mm).
 3. Panel Type: Smooth surface.
 4. Panel Height: 1.5 inches (38 mm).
 5. Material: Zinc-coated (galvanized) steel sheet 24-gage nominal thickness.
 6. Vented Panels: Where indicated on the Drawings.

2.5 ACCESSORIES

- A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, 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 closures at eaves and rakes, 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.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Formed from 0.018-inch (0.46-mm) minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. 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, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

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. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- C. Provide panel profile, including major ribs, for full length of panel.
- D. Fabricate metal wall panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, and that will minimize noise from movements within panel assembly.
- E. 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 mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, 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 girts, 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 subgirts, 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 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Commence metal wall panel installation and install minimum of 300 sq. ft. (27.8 sq. m.) in presence of factory-authorized representative.
 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. Install flashing and trim as metal wall panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. 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 weathertight escutcheons for pipe and conduit penetrating exterior walls.
- B. Fasteners:
1. Steel Wall Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal wall panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated 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."
- E. 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. Lap ribbed or fluted sheets with snap-lock rib profile standard with manufacturer. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
2. Provide pop rivets with colored heads matching finish of metal panels where fasteners are exposed.
3. 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.
4. Provide sealant tape at lapped joints of metal wall panels and between panels and protruding equipment, vents, and accessories.
5. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps; on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weathertight.
6. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

3.4 METAL SOFFIT PANEL INSTALLATION

- A. In addition to complying with requirements of "Metal Wall Panel Installation, General" Article, install metal soffit panels to comply with the requirements of this article.
- B. Metal Soffit Panels: Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.
 1. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.

3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install components required for a complete metal wall 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 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 (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints

of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.6 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 074213.13 – COMPREHENSIVE RAINSCREEN ASSEMBLY

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. Work described in this section includes concealed-fastener, lap-seam pre-formed metal wall panel system complete with clips, perimeter and penetration flashing and closures.
- B. Section also includes:
 - 1. Air and Water Barrier
 - 2. Thermal Building Insulation
 - 3. Metal Sub Framing
 - 4. Pre-Formed Metal Wall Panels
- C. Related Requirements:
 - 1. Section 072100 “Thermal Insulation” for mineral-wool board (semi-rigid) insulation and Z-furring at contractor’s option.
 - 2. Section 072726 “Fluid-Applied Membrane Air Barriers” for the vapor-permeable, fluid-applied air barriers at contractor’s option.
 - 3. Section 074213 “Metal Wall Panels and Soffit Panels” for metal wall panels at contractor’s option.

1.3 DESIGN & PERFORMANCE CRITERIA – F.A. AIR & WATER BARRIER

- A. General Performance: Fluid applied water resistive air barrier system shall be furnished and installed without failure due to defective manufacture, application, installation, or other defects in construction.
- B. Air Leakage.
 - 1. The fluid applied air barrier shall have less than 0.040 cfm/ft² of air leakage when tested in accordance with ASTM E2357.
 - 2. The fluid applied air barrier shall have less than 0.004 cfm/ft² at 1.57 psf when tested in accordance with ASTM E2178.
- C. Vapor Permeance: The fluid applied air barrier shall be vapor permeable with a minimum vapor transmission rate of 12 perms when tested in accordance with ASTM E96, Method B.

- D. Peel Adhesion: The fluid applied air barrier shall have a minimum peel adhesion to concrete and exterior sheathing of at least 20 lbf/in when tested in accordance with ASTM D903.
- E. Low Temperature Flexibility: The fluid applied air barrier shall be tested in accordance with the low temperature flexibility testing of ASTM D1970 and pass at a temperature of -15°F.
- F. Elongation: The fluid applied air barrier shall have a minimum elongation of 1,200% when tested in accordance with ASTM D412.
- G. Surface Burning Characteristics: The fluid applied air barrier shall have be rated as Class material with a flame spread rating of less than and a smoke-development index of less than when tested in accordance with ASTM E84.

1.4 DESIGN AND PERFORMANCE CRITERIA – THERMAL INSULATION

- A. General Performance: Continuous exterior rigid mineral fiber board thermal insulation shall satisfy all requirements of ASTM E612, Type IV-B, shall be free of defects, and meet each of the performance requirements specified herein.
- B. Thermal Resistance:
 - 1. At 25°F, the R-value per inch thickness shall be 4.3 hr·ft²·°F/BTU minimum, in accordance with ASTM C518/C177.
 - 2. At 75°F, the R-value (RSI-value) per inch (25.4mm) thickness shall be 3.9 hr·ft²·°F/BTU minimum, in accordance with ASTM C518/C177.
- C. Fire and Heat Performance:
 - 1. Surface Burning Characteristics: Flame spread rating shall be 0 and smoke development rating shall be 0 when tested in accordance with ASTM E84.
 - 2. Combustibility: The board insulation shall be rated as “Non-Combustible” when tested in accordance with ULC S114.
 - 3. The board insulation shall not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat at 1,382°F, in accordance ASTM E136.
 - 4. The board insulation shall be considered Non-Combustible when tested in accordance with NFPA 268 and shall be deemed to be acceptable for use in exterior walls of Type I, II, III, and IV building construction without any constraints, such as use of a thermal barrier, as may be required by NFPA 285.
 - 5. The board insulation shall be rated for a 1,200°F service temperature, as determined by testing in accordance with ASTM C411.
- D. Moisture Resistance:
 - 1. Water absorption, as measured in accordance with ASTM C209, shall not exceed 1.2%.
 - 2. Water vapor sorption, as measured in accordance with ASTM C1104, shall not exceed 0.30%.
 - 3. Water vapor transmission, as measured in accordance with ASTM E96, shall be at least 40 perms.
- E. Dimensional Stability and Physical Properties:

1. The board insulation shall have a minimum density of 11.0 pcf as measured in accordance with ASTM C612.
2. The board insulation shall have a minimum compressive strength of 1,220 psf at 10% maximum deformation when tested in accordance with ASTM C165.
3. The board insulation shall have a maximum of 0.38% linear shrinkage at 1,200° F when tested in accordance with ASTM C356.
4. The board insulation shall exhibit dimensional stability of a maximum linear change of 0.1% after 7 days in accordance with ASTM D2126 at each of the following climate conditions:
 - a. 40°F with ambient relative humidity;
 - b. 200°F with ambient relative humidity;
 - c. 158°F with 97% relative humidity.

F. Acoustical Performance: When tested in accordance with ASTM C423, a 2-inch insulation board shall have a NRC rating of 0.85 minimum.

G. Corrosion Resistance:

1. The insulation board shall be rated “Non-corrosive” to steel when tested in accordance with ASTM C665.
2. The insulation board shall conform with the requirements of ASTM C795 with respect to corrosion resistance in contact with stainless steel materials.

1.5 DESIGN AND PERFORMANCE CRITERIA - METAL WALL PANELS

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. Thermal Expansion and Contraction.

1. Completed metal wall panel and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling or reducing performance ability.
2. The design temperature differential shall be not less than 220 degrees Fahrenheit.
3. Interface between panel and clip shall provide for unlimited thermal movement in each direction along the longitudinal direction.

C. Uniform Wind Load Capacity.

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.

D. Back Drained and Ventilated Rain Screen Wall Cladding Systems

1. The comprehensive rainscreen assembly, including all components listed in Article 1.5 A. of this specification, shall be tested in accordance with AAMA 509-09.
 - a. The comprehensive rainscreen assembly must pass with a minimum Ventilation Classification of V4.
 - b. The comprehensive rainscreen assembly must pass with a maximum Water Penetration Classification of W1.

1.6 SUBMITTALS

- A. General, Rainscreen Wall Assembly Components: Complete submittals shall be made jointly and simultaneously for all components of the Rainscreen wall assembly, including:
 1. Air and water resistive barrier;
 2. Vapor retarders and/or barriers, if applicable;
 3. Rainscreen wall continuous exterior insulation;
 4. Metal rainscreen wall cladding panels and sub framing components;
 5. All other trim, flashing, sealants, and components necessary for a complete rainscreen wall assembly as required by these specifications.
- B. Shop drawings:
 1. Show complete rain screen wall system with air and water barrier(s), vapor retarder (if applicable), continuous exterior insulation, sub framing system, metal cladding panels, ventilation components, flashings and accessories in elevation, sections, and details. Include metal thicknesses and finishes, panel lengths, joining details, anchorage details, flashings and special fabrication provisions for termination and penetrations. Indicate relationships with adjacent and interfacing work.
 2. All components shall be integrated into a single comprehensive and complete shop drawing set prepared by the metal cladding system manufacturer.
 3. Shop drawings shall identify each product and component by manufacturer, product name, and thickness, size, style, or other uniquely distinguishing characteristics.
- C. Design Test Reports.
 1. Submit copies of design test reports for each of the performance testing standards listed in specification article 1.4.
 2. Test reports shall be performed by independent, accredited testing laboratories, and shall bear the seal of a registered professional engineer.
- D. Warranty: Provide unexecuted specimen warranty documents for each warranty as required in specification article 1.12.
- E. Samples.
 1. Submit sample of panel section, at least 6" x 6" showing seam profile, and also a sample of color selected.
 2. Submit sample of panel clip, foam closures, and field applied sealants.

1.7 QUALITY CRITERIA/INSTALLER QUALIFICATIONS

- A. Engage an experienced metal wall panel contractor (erector) to install wall panel system who has a minimum of (5) five years' experience specializing in the installation of metal wall systems.
- B. Contractor must be certified by manufacturer specified as a supplier of the metal wall system and obtain written certification from manufacturer that installer is approved for installation of the specified system.
- C. Successful contractor must obtain all components of the Rainscreen wall system from a single manufacturer. Any secondary products that are required which cannot be supplied by the specified manufacturer must be recommended and approved in writing by primary manufacturer prior to bidding.
- D. Air Barrier Quality Assurance Auditing.
 - 1. The air barrier supplier shall provide an accredited third-party air barrier auditor/inspector at the beginning and end of the air barrier installation, and at no fewer intermediate intervals than once per 20,000 square feet of air barrier installation.
 - 2. The air barrier auditor/inspector shall have sufficient credentials to satisfy the architect, such as Air Barrier Association of America (ABAA) certification, RCI Registered Exterior Wall Consultant, or similar professional experience and credentials.
 - 3. The air barrier installer shall perform daily inspections, tests, reporting, and other information as requested by the third-party auditor/inspector.
 - 4. The air barrier installer shall coordinate, cooperate, and comply with the recommendations of the third-party auditor/inspector.

1.8 MOCK-UPS.

- A. Where directed by architect, construct typical exterior wall panel, 6-foot long by 6-foot wide incorporating the sheathing board or substrate, sill pan protection system, window frame and attachment method, clips, sub framing, attachment of insulation and detailing of water-resistive vapor permeable air barrier membrane application and lap seams.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Inspect materials upon delivery.
- B. Handle materials to prevent damage.
- C. Store materials off ground providing for drainage; under cover providing for air circulation; and protected from any debris.

1.10 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal wall panel work to be performed according to manufacturer's written instructions and warranty requirements.

- B. Field Measurements: Verify actual dimensions of construction contiguous with metal wall panels by field measurements before fabrication.

1.11 COORDINATION

- A. Coordinate sizes and locations of windows, doors, and wall penetrations with actual equipment provided.
- B. Coordinate metal wall panels with rain drainage work, flashing, trim, and construction of other adjoining work to provide a leak proof, secure, and noncorrosive installation.

1.12 WARRANTIES

- A. Endorse and forward to owner the following warranties:
 - 1. Special Rainscreen System Water Tightness Warranty: The comprehensive rainscreen assembly supplier shall provide a ten (10) year warranty from date of Substantial Completion against uncontrolled water leakage to the interior of the building. The warranty shall identify the product name, and model number each component of the Rainscreen wall system, including each of those components listed in Article 1.6 A of this specification.
 - 2. Manufacturer's standard 20-year material and finish warranty covering checking, crazing, peeling, chalking, fading, and adhesion of the pre-painted sheet metal materials.
- B. Warranties shall commence on date of substantial completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

- A. Pre-Painted, Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A755/A755M.
 - 1. Surface: Smooth, flat finish.
 - 2. Exposed Coil-Coated Finish:
 - a. Mica Fluoropolymer: AAMA 621. 2-coat fluoropolymer finish with suspended mica flakes 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 (MWP-1): Basis-of-design color is Metal Design Systems, Inc.; Apolic, MTLC PEX Pewter.
 - 3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

B. Panel Sealants:

1. Seam Sealant: Field Applied Butyl-Based, Solvent-Release, One-Part Sealant.
2. Sealant Tape: Non-curing, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1-inch wide and 1/16-inch thick.
3. Exposed Sealant: ASTM C 920; elastomeric tri-polymer, polyurethane, or other advanced polymer 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.
4. Concealed Sealant: ASTM C 1311: Butyl-Based, Solvent-Release, One-Part Sealant.

2.2 AIR AND WATER BARRIER

A. Air and Water Barrier Membrane Materials.

1. The basis of design shall be WeatherGuard SPWP by Innovative Metals Company, Inc. (IMETCO), Norcross, Georgia (407) 375-0600.
2. Material: Fluid applied vapor permeable acrylic membrane that cures to form a water resistive air barrier.
3. Application Rate/Thickness: Apply at a rate of 25 to 30 ft²/gal to achieve a wet film thickness of 60 to 80 mils resulting in a cured dry film thickness of 30-40 mils.
4. Allowable UV Exposure: Air barrier may be left permanently exposed to sunlight.
5. Application Method: Airless sprayer or brush
6. Cure Time: Under normal conditions, the product shall be dry to touch in 2 to 4 hours and fully cured within 24 hours of application.
7. VOC Content: Less than 0.20 lb/gal.

2.3 THERMAL BUILDING INSULATION

A. Mineral fiber rigid- board insulation:

1. The basis of design shall be ROXUL Comfort Board CIS by Innovative Metals Company, Inc. (IMETCO), Norcross, Georgia (407) 375-0600.
2. Material: Basalt rock and slag mineral fiber board insulation, Type IV-B in accordance with ASTM C612.
3. Thickness: 3inches.
4. Size: Manufacturer's standard.

B. Spray or Roll Applied Coating: Provided spray or roll applied coating on mineral-wool board/semi-rigid insulation where fiber reinforced cementitious wall panels are installed only. Refer to Drawings for location.

1. Manufacturers:
 - a. Dow Corning; All Guard.
 - b. Dow Corning; Defend Air 200.
 - c. Prosoco; R-Guard Cat 5 Rain Screen.
 - d. Momentive; SEC2600 SilShield AWB.

2. Color: Black.
3. Installation: Per manufacturer's recommendation for use over mineral-wool board/semi-rigid insulation and metal girt system.

2.4 METAL SUBFRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653, G90 hot-dip galvanized.

B. Vertical Channel Shaped Strut:

1. The basis of design shall be Hat Channel by Innovative Metals Company, Inc. (IMETCO), Norcross, Georgia (678) 656-1265.
2. Dimensions:
 - a. Nominal Thickness: 16-gauge nominal thickness.
 - b. Depth: 1-1/2 inches nominal.
 - c. Front Flange: 1-13/16 inches nominal, with 1-1/2 inches diameter holes punched at 8" on center.
 - d. Rear Flange: 4 inches nominal with 1/4-inch holes punched at 8" on center and aligned with holes in the front flange.
3. Location: As indicated on the Drawings.

C. Horizontal Hat-shaped Vented Girts:

1. The basis of design shall be Vented Hat Channel by Innovative Metals Company, Inc. (IMETCO), Norcross, Georgia (678) 656-1265.
2. Dimensions:
 - a. Nominal Thickness: (18 gauge) nominal thickness.
 - b. Depth: 7/8-inch nominal.
 - c. Top flange: 2-1/2 inches nominal.
 - d. Bottom Flanges: 1-1/2 inches nominal with 1/4-inch holes punched at 8" on center in each flange.
3. Free air flow: The vented girt shall not restrict chimney effect air convection in the vertical direction. The vented girt webs shall have slotted holes providing for 31% free air flow and weep holes for water drainage.
4. Drainage: Web segments of vented girt shall be formed such that when installed in the horizontal orientation the web segments are inclined at least 20 degrees from horizontal to promote drainage and prevent retention of standing water.
5. Location: As indicated on the Drawings.

2.5 METAL WALL PANELS

- A. General: Provide factory-formed metal panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically

attaching panels to supports using concealed clips in side laps. Include clips, cleats and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Vertical-Rib, Standing-Seam Metal Roof Panels: Formed with smooth, flat panels between panel edges, designed for sequential installation by mechanically attaching panels to supports using concealed clips located over the male side of one panel and under the female side of the opposite panel, and mechanically seaming panels 180°.
1. Basis-of-Design System: Panel shall be IMETCO TwinLok 1.5 (TL 1.5) wall panel system as manufactured by Innovative Metals Company, Inc. (IMETCO), Norcross, Georgia, telephone 1-678-656-1265.
 2. Material: Zinc-coated (galvanized) steel sheet, 22-gauge nominal thickness.
 3. Characteristics:
 - a. The same panel profile from a single manufacturer shall be used for ALL standing seam areas.
 - b. Configuration: Interlocking standing seams incorporating concealed anchor clips allowing thermal movement. Snap-on separate seam caps are not acceptable.
 - 1) Profile of panel shall be smooth throughout the flat portion on the panel.
 - 2) Exposed fasteners, screws and/or roof mastic are unacceptable and will be rejected. System configuration only allows for exposed fasteners at panel overlap (if required and approved) and trim details (as per manufacturer's guidelines).
 - 3) Panels must be furnished in continuous lengths with no overlaps, unless shown on contract documents.
 - c. Seam: 1.5 inch (38 mm) minimum height. Seam shall allow for expansion and contraction of panels due to thermal changes.
 - d. Sealant: Female seam shall have a factory applied hot melt sealant bead. Clip shall be designed to insure that normal expansion and contraction of panel will not cause damage to the integrity of the seal.
 - e. A clearance of 7/16 inch (11 mm) high between the panel and the roof substrate is required to conceal telegraphing of the supporting structure and to aid in venting the roof system.
 - f. Site Formed Panels: Bidder will not be allowed to supply panels formed at the job-site on portable roll formers; metal panels must be factory pre-manufactured and engineered for this project.
 - g. Concealed Standard Anchor Clips: Clips base must be 18 gauge (1.2 mm) galvanized steel with 22 gauge (0.7 mm) galvanized steel sliding top. Clips must be two (2) piece design to provide for a minimum of three (3) inches of total thermal movement in the longitudinal dimension. One-piece clips are NOT acceptable.
 - h. Standing Seam Panel Width: 12-inch (nominal).

2.6 MISCELLANEOUS MATERIALS

- A. Concealed fasteners: Corrosion resistant steel screws, #10 minimum diameter x length appropriate for substrate, hex washer head or pancake head. Use self-drilling, self-tapping for metal substrate or A-point for plywood substrate.

2.7 ACCESSORIES

- A. Wall Panel Accessories: Provide components approved by panel manufacturer and as required for a complete metal wall panel assembly including trim, corner units, closures, clips, flashings, sealants, gaskets, fillers, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
 - 1. Anchor Clips: Clips shall be 18-gauge galvanized steel designed to allow thermal movement of the panel in each direction along the longitudinal dimension.
 - 2. Spline Strip at Vertical Reveal: At the vertical reveal joint sheet metal spline material shall be provided in the same material type and finish as the metal cladding panels for all visible space at the reveal joint. Spine strip material thickness shall be as recommended by manufacturer based on installation tolerances.
 - 3. Corner Units: For horizontally oriented panel installations only, provide factory fabricated mitered corner units of the same profile(s) as specified. Corner units shall be furnished for outside and inside corner conditions.
 - 4. Ventilation strips shall be provided at top of wall panels, window sills, and transitions between metal panels and other exterior finish materials to allow for air exhaust at top of wall cavity. Vent strips shall be internally baffled to prevent wind driven rain from freely entering the wall cavity.
 - 5. Ventilation strips shall be provided at base of wall panels, window head, and transitions between metal panels and other exterior finish materials to allow for air intake and water weep holes at bottom of wall cavity.
- B. Flashing and Trim: Formed from same material and gauge as wall panels, pre-painted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, head, sill, corners, jambs, framed openings, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

2.8 FABRICATION

- A. Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. 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. Form flashing components from full single width sheet in minimum 10'-0" sections. Provide mitered trim corners, joined using closed end pop rivets and butyl-based, solvent released one-part sealant.

- D. 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 nonexpanding but movable joints in metal to accommodate butyl-based 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 of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal wall panel manufacturer for application, but not less than thickness of metal being secured.

2.9 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: 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, metal wall panel supports, and other conditions affecting performance of the Work.
- B. Examine primary and secondary wall framing to verify that girts, studs, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal wall panel manufacturer.
- C. Examine solid 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.
- D. 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.

- E. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.
- B. Substrate Board: Install substrate boards over wall structure on entire wall surface. Attach with substrate-board fasteners.
 - 1. Install substrate board with long joints in continuous straight lines, horizontally oriented with end joints staggered between courses. Tightly butt substrate boards together.
- C. Miscellaneous Framing: Install sub-framing, furring, and other miscellaneous wall panel support members and anchorage according to metal wall panel manufacturer's written instructions.
- D. Establish straight, side and crosswise benchmarks
- E. Use proper size and length fastener for strength requirements. Approximately 5/16 inch is allowable for maximum fastener head size beneath the panel.
- F. All walls shall be checked for square and straightness. Inside and outside corners may not be plumb; set a true line for the corner units and flashing with string line.
- G. Measure the wall lengthwise to confirm panel lengths and verify clearances for thermal movement.

3.3 METAL WALL PANEL INSTALLATION

- A. All details will be shown on in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.
- B. Directly over the completed wall substrate, install one-piece clips. All anchor clips will be fastened into the structural wall substrate based on spacing determined by ASCE 7
- C. Installation of Wall Panels: Wall panels can be installed by starting from one end and working towards the opposite end (vertical orientation), or from the bottom of wall working towards the top of the wall (horizontal orientation).
- D. Isolate dissimilar metals and masonry or concrete from metals with bituminous coating. Use gasketed fasteners where required to prevent corrosive action between fastener, substrate, and panels.
- E. Limit exposed fasteners to extent indicated on contract drawings.
- F. Seal laps and joints in accordance with wall panel system manufacturer's product data.

- G. Coordinate flashing and sheet metal work to provide weathertight conditions at wall terminations. Fabricate and install in accordance with standards of SMACNA Manual.
- H. Provide for temperature expansion/contraction movement of panels at wall penetrations and wall mounted equipment in accordance with system manufacturer's product data and design calculations.
- I. Installed system shall be true to line and plane and free of dents, and physical defects. In light gauge panels with wide flat surfaces, some oil canning may be present. Oil canning does not affect the finish or structural integrity of the panel and is therefore not cause for rejection.
- J. At joints in linear sheet metal items, set sheet metal items in two 1/4-inch beads of butyl sealant. Extend sealant over all metal surfaces. Mate components for positive seal. Allow no sealant to migrate onto exposed surfaces.
- K. Remove damaged work and replace with new, undamaged components.
- L. Touch up exposed fasteners using paint furnished by the panel manufacturer and matching exposed panel surface finish.
- M. Clean exposed surfaces of wall panels and accessories after completion of installation. Leave in clean condition at date of substantial completion. Touch up minor abrasions and scratches in finish.

3.4 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal wall panel units within installed tolerance of 1/4 inch in 20 feet at location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Install insulation board units within installed flatness tolerance of no more than 1/4 inch in 20 feet at location lines as indicated and within or more than 1/8-inch offset of adjoining edges. Gap between boards shall be no more than 1/8-inch. Insulation boards shall be installed in continuous contact with back-up wall exterior surface

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal soffit panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal soffit panels where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal soffit panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal soffit panel installation, clean finished surfaces as recommended by metal soffit panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal soffit panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.13

SECTION 074243 – METAL-FACED COMPOSITE WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:

- 1. Metal-faced composite wall panels.

- B. Related Sections:

- 1. Section 054000 "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal-faced composite wall panels.
- 2. Section 072726 "Fluid-Applied Membrane Air Barriers" for continuous air barrier systems.
- 3. Section 076200 "Sheet Metal Flashing and Trim" for field-formed flashings and other sheet metal work not part of metal-faced composite wall panel assemblies.

1.3 DEFINITION

- A. Metal-Faced Composite Wall Panel Assembly: Metal-faced composite wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weathertight wall system.

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal-faced composite wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) 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. (75 Pa).
- C. Water Penetration Under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

- D. Structural Performance: Provide metal-faced composite wall 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-faced composite wall 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.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal-faced composite wall panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal-faced composite wall 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.
1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):
 - a. Flashing and trim.
 - b. Anchorage systems.
- C. Samples for Initial Selection: For each type of metal-faced composite wall panel indicated with factory-applied color finishes.
1. Include similar Samples of trim and accessories involving color selection.
 2. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
1. Metal-Faced Composite Wall Panels: Minimum 12 x 12 inches (300 x 300 mm). Include fasteners, closures, and other metal-faced composite wall panel accessories.
 - a. Composite Panels: Include four-way joint.

2. Trim and Closures: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
3. Accessories: 12-inch- (300-mm-) long Samples for each type of accessory.
4. Exposed Gaskets: 12 inches (300 mm) long.
5. Exposed Sealants: For each type and color of joint sealant required. Install joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of metal-faced composite wall panels adjacent to joint sealants.

E. Qualification Data: For Installer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

G. Field quality-control reports.

H. Maintenance Data: For metal wall panels to include in maintenance manuals.

I. Warranties: Samples of special warranties.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of metal-faced composite wall panel from single source from single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal-faced composite wall panels, and other manufactured items so as not to be damaged or deformed. Package metal-faced composite wall panels for protection during transportation and handling.

B. Unload, store, and erect metal-faced composite wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Store metal-faced composite wall panels vertically, covered with suitable weathertight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal-faced composite wall panels in contact with other materials that might cause staining, denting, or other surface damage. Do not allow storage space to exceed 120 deg F (49 deg C).

D. Retain strippable protective covering on metal-faced composite wall panel for period of panel installation.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal-faced composite wall panels to be performed according to manufacturer's written instructions and warranty requirements.

- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal-faced composite wall panel fabrication and indicate measurements on Shop Drawings.

1.9 COORDINATION

- A. Coordinate metal-faced composite wall panel assemblies with rain drainage work, flashing, trim, and construction of studs, 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-faced composite 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: Two years from date of Substantial Completion.

- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal-faced composite wall 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 PANEL MATERIALS

- A. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

- 1. Surface: Smooth, flat finish.
- 2. Exposed Coil-Coated Finishes:

- a. Mica Fluoropolymer: AAMA 621. 2-coat fluoropolymer finish with suspended mica flakes 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 (MWP-2): Basis-of-design color is Metal Design Systems, Inc.; Apolic, MTLC PEX Pewter.
 - 2) Color (MWP-3): Basis-of-design color is Metal Design Systems, Inc.; Apolic, MTLC TBX Silver.
3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Panel Sealants:

1. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal-faced composite wall panels and remain weathertight; and as recommended in writing by panel manufacturer.

2.2 MISCELLANEOUS MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use and finish indicated.
- B. 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-faced composite wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.3 METAL-FACED COMPOSITE WALL PANELS (MWP-2 and MWP-3)

- A. General: Provide factory-formed and -assembled, metal-faced composite wall panels fabricated from two metal facings bonded, using no glues or adhesives, to solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Citadel; Envelope 2000 RS Wall System, or comparable product by one of the following:
 - a. Alcan Composites USA Inc.; Alucobond.
 - b. Alcoa Inc.; Reynobond PE.
 - c. Alcotex, Inc.; System III.
 - d. ALPOLIC, Division of Mitsubishi Chemical America, Inc.; ALPOLIC.
 - e. Copper Sales, Inc.; UNA-FAB Series 1500.
 - f. John W. McDougall Co.; Series 400.
 - g. Metal Design Systems, Inc.; Series 20.
 - h. Shaffner Heaney Associates, Inc.; RLS-9000.
 - i. Universe Corporation; Universe 6000.

- B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- (0.50-mm-) thick, coil-coated aluminum sheet facings.
 - 1. Panel Thickness: As indicated on Drawings.
 - 2. Core: Standard.
- C. Attachment System Components: Formed from extruded aluminum material compatible with panel facing.
 - 1. Include manufacturer's standard perimeter extrusions with integral weather stripping, panel stiffeners, panel clips and anchor channels.

2.4 ACCESSORIES

- A. Wall Panel Accessories: Provide components required for a complete metal-faced composite wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal-faced composite wall panels unless otherwise indicated.
- B. Flashing and Trim: Formed from 0.018-inch- (0.46-mm-) minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. 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, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal-faced composite wall panels.

2.5 FABRICATION

- A. General: Fabricate and finish metal-faced composite 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. Fabricate metal-faced composite wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- C. Metal-Faced Composite Wall 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 (5 mm) maximum.
- D. 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.
 - 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-faced composite wall panel manufacturer.
- a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal-faced composite wall panel manufacturer for application, but not less than thickness of metal being secured.

2.6 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 mechanical and painted 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 not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal-faced composite wall 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 metal-faced composite 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-faced composite wall panel manufacturer.
 3. Verify that weather-resistant sheathing paper has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal-faced composite wall panels to verify actual locations of penetrations relative to seam locations of panels before panel 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 METAL-FACED COMPOSITE WALL INSTALLATION

- A. General: Install metal-faced composite wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Commence metal-faced composite wall panel installation and install minimum of 300 sq. ft. (27.8 sq. m) in presence of factory-authorized representative.
 2. Shim or otherwise plumb substrates receiving metal-faced composite wall panels.
 3. Flash and seal metal-faced composite wall 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 flashing and trim as metal-faced composite wall panel work proceeds.
 5. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
 6. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.
- B. Fasteners:
1. Aluminum Wall Panels: 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 wall panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal-faced composite wall panel assemblies. Provide types of

gaskets, fillers, and sealants indicated or, if not indicated, types recommended by panel manufacturer.

1. 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-faced composite wall panels and to provide a complete weathertight wall system, including subgirts, 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. Clip Installation: Attach panel clips to supports at each metal-faced composite wall panel joint at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-returned flanges of wall panels to panel clips with manufacturer's standard fasteners.
1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Section 079200 "Joint Sealants."
- G. Rainscreen-Principle Installation: Provide manufacturer's standard pressure-equalized, rainscreen-principle system with vertical channel that provides support and complete secondary drainage system, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach wall panels by engaging horizontal support pins into notches in vertical channels and into flanges of wall panels. Leave horizontal and vertical joints with open reveal.
1. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
 2. Do not apply sealants to joints unless otherwise indicated on Drawings.

3.3 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal-faced composite wall 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 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 (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal-faced composite wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal-faced composite wall panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal-faced composite wall panel installation, clean finished surfaces as recommended by panel manufacturer. Maintain in a clean condition during construction.
- B. After metal-faced composite wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal-faced composite wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074243

SECTION 075216 - STYRENE-BUTADIENE-STYRENE (SBS) 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. General conditions and details for all roof areas:

- a. At all perimeter and projection base flashing, adhere specified elastomeric flashings in specified adhesive.
- 1) Prime masonry wall prior to installing base ply.
 - 2) New base flashing shall be installed without wrinkles.
 - 3) New base flashing will extend a minimum of 10 inches onto field of the roof.
 - 4) At Base Flashing:
 - a) Install bar termination at the top edge of all base flashing where the flashing is not wrapped over a curb, wall, or expansion joint.
 - b) Base flashing height shall be a minimum of 8 inches and shall not exceed 15 inches.
Flashing over 15 inches shall be bar terminated. Another flashing membrane wrapped over the above wall and extended down past the bar termination a minimum of 4 inches shall be installed, or new metal wall panels approved by roofing material manufacturer.
 - c) Install fiberboard cant at all base flashing with specified adhesive. Perlite will not be accepted. Add wood cant for vent flashing where any 90 degree corners are in place. Provide shop drawing of these flashings.
 - 5) Install base flashings in 3-foot sections,
 - 6) Provide a 3-course strip-in of specified mastic/mesh/mastic at all vertical flashing laps, horizontal edges, and corners of flashing.
 - 7) Install specified counterflashing over termination bar. Termination bar shall always be covered with counterflashing.
 - a) Counterflashing shall extend over bar termination a minimum of 4 inches.

- 8) All brick and block walls shall require new 24-gauge reglet joint counterflashing.
 - a) Width shall be sufficient to extend down over bar termination a minimum of four inches.
- 9) New 24-gauge metal end covers and 90-degree corners shall be installed to properly terminate ends of all sheet metal details.
- 10) Install new 22-gauge continuous cleat, fastened to the concrete (meeting SMACNA standards) to secure raised metal edge detail.
- 11) Install non-perlite, fiberboard tapered edge strips as needed along perimeters, projections, and transitions to properly slope roof areas and eliminate ponding water. Remove existing roof membrane, insulation, copings, scuppers, and perimeter metal down to existing wood roof decks.
- 12) Install perimeter and projection flashing and metal details as specified prior.
- 13) Install new gutters and expansion joint where specified.
- 14) Install new 24-gauge pre-finished gutters and metal edge details per drawing, summary, and manufacturer accepted metal detailing standards. Submit shop drawing for manufacturers approval prior to starting project. Extend the exterior edge a minimum of 1 inch past where the existing fascia stops. Any exterior edge length exceeding 6 inches needs to have a stiffening rib. Use 2-piece metal detail to cover exposed deck. Provide shop drawing of these metal details prior to starting project.
- 15) Install base layer(s) of insulation as specified.
- 16) Adhere 1/4-inch gypsum coverboard as specified.
- 17) Adhere specified base plies in specified adhesive.
- 18) Adhere specified cap sheet in specified adhesive.
- 19) Adhere specified flashings in specified adhesive.
- 20) Apply one (1) coat of Double Duty Aluminum.
- 21) Strip in seams with three course application as specified.
- 22) Provide 20 yr. manufacturer's warranty

B. Related Sections:

1. Section 072100 "Thermal Insulation."
2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
3. Section 079200 "Joint Sealants" 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 PRODUCTS

- A. Owner Furnished Materials (See Material List Attachment to Form of Proposal)

1. Please review attachments with bid form to determine the products and quantities that the Owner has purchased directly from manufacturer.

2. The contractor will be responsible for all other products needed to complete project per the specification and drawings.
3. The unloading of material and the storage of said material in a secure area is the sole responsibility of the contractor.

1.5 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane 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. Membrane roofing and base flashings shall remain watertight.
1. Accelerated Weathering: Roofing system shall withstand 2000 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: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a roofing system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
1. Fire/Windstorm Classification: Class 1A-60.
 2. Hail Resistance Rating: MH.
- D. Roofing Membrane System Load-Strain Properties: Provide a roofing membrane identical to component systems that have been successfully tested by a qualified independent testing and inspecting agency to meet the following minimum load-strain properties at membrane failure when tested according to ASTM D 2523:
1. Minimum number of plies: Three (3)
 2. Tensile strain at failure, at 0 deg F (-18 deg C): 288.58 lbf machine direction, minimum; 4.03 percent elongation, maximum.
 3. Tensile strain at failure, at 0 deg F (-18 deg C): 296 lbf cross-machine direction, minimum; 3.58 percent elongation, maximum.
- E. Flashings and Fastening: Comply with requirements of Section 076200 "Sheet Metal Flashing and Trim". Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:
1. FM Global 1-49: Loss Prevention Data Sheet for Perimeter Flashings.
 2. FM Global 1-29: Loss Prevention Data Sheet for Above Deck Roof Components.
 3. NRCA Roofing Manual (Sixth Edition) for construction details and recommendations.
 4. SMACNA Architectural Sheet Metal Manual (Seventh Edition) for construction details.

- F. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

1.6 PREINSTALLATION CONFERENCE:

- A. Preinstallation Roofing Conference: Conduct conference at Project Site.
 - 1. Meet with Owner, Architect, 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, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
 - 7. Review governing regulations and requirements for insurance and certificates if applicable.
 - 8. Review temporary protection requirements for roofing system during and after installation.
 - 9. Review roof observation and repair procedures after roofing installation.

1.7 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work. Provide roof plan showing orientation and types of roof deck, orientation of membrane roofing, and fastening spacings and patterns for mechanically fastened components.
 - 1. Base flashings and built-up terminations.
 - a. Indicate details meet requirements of NRCA and FMG required by this Section.
 - 2. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- C. Samples for Verification: For the following products:
 - 1. 8-by-10-inch (254-by-254-mm) of sheet roofing materials, including base sheet membrane cap sheet and flashing sheet, of color specified.
 - 2. 8-by-10-inch (254-by-254-mm) square of roof insulation.
 - 3. 3 lb (1.5 kg) of aggregate surfacing material in gradation and color indicated.
 - 4. Six insulation fasteners of each type, length, and finish.

1.8 INFORMATIONAL SUBMITTALS

- A. Contractor's Product Certificate: Submit notarized certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.
- B. Qualification Data: For Installer, Manufacturer, and Roofing Inspector.
 - 1. Include letter from Manufacturer written for this Project indicating approval of Installer.
- C. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of compliance with performance requirements, including FMG system approval and roofing membrane system load/strain property test report.
 - 2. Indicate that proposed system components are compatible.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of built-up roofing.
- E. Inspection Reports: Daily reports of Roofing Inspector. Include weather conditions, description of work performed, tests performed, defective work observed, and corrective actions taken to correct defective work.
- F. Product Data: For each type of product.
- G. Samples for Verification: For the following products:
 - 1. Granule-Surfaced Cap Sheet.
 - 2. Roofing Insulation.
- H. Qualification Data: For qualified installer and manufacturer.
- I. 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.
- J. Product Test Reports: For components of membrane roofing system, for tests performed by manufacturer and witnessed by a qualified testing agency.
- K. Research/Evaluation Reports: For components of membrane roofing system, from ICC-ES.
- L. Sample Warranties: For manufacturer's special warranties.

1.9 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

1.10 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to communicate verbally with Contractor, Architect, and employees, and qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.
- B. Manufacturer Qualifications: Approved manufacturer listed in this Section, UL listed for roofing systems identical to that specified for this Project, with minimum five years' experience in manufacture of specified products in successful use in similar applications.
 - 1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
 - a. Product data, including certified independent test data indicating compliance with requirements.
 - b. Samples of each component.
 - c. Project references: Minimum of five installations of specified products not less than five years old, with Owner and Architect contact information.
 - d. Sample warranty.
 - 2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
 - 3. Approved manufacturers must meet separate requirements of Submittals Article.
- C. Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:
 - 1. An authorized full-time technical employee of the manufacturer.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.12 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.

1.13 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 membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, and other components of roofing system.
 - 2. Warranty Period: 15 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, and walkway products, for the following warranty period:
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by a manufacturer meeting the qualification requirements in Quality Assurance Article.
- B. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 ROOFING SHEET MATERIALS

- A. Ply Sheet/: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt.
 - 1. Net Dry Mass, ASTM D146: 360 g/sq. m (7.5 lb/100 sq. ft.).

2. Breaking Strength, minimum, ASTM D146: machine direction, 7.7 kN/m (44 lbf/in); cross machine direction, 7.7 kN/m (44 lbf/in).
- A. Roofing Membrane Cap Sheet/Base Flashing Cap: ASTM D6163, Grade G, Type I, glass-fiber-reinforced, SBS-modified asphalt sheet; granular surfaced.
1. Exterior Fire-Test Exposure, ASTM E 108: Class A.
 2. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: machine direction 80.0 lbf/in (14.0 kN/m); cross machine direction 70.0 lbf/in (12.0 kN/m).
 3. Tear Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: machine direction, 100 lbf (440 N); cross machine direction 100 lbf (440 N).
 4. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D 5147: machine direction 7.5 percent; cross machine direction 7.5 percent.
 5. Low Temperature Flex, maximum, ASTM D 5147: -15 deg. F (-26 deg. C).
 6. Thickness, minimum, ASTM D 5147: 0.120 inch (3 mm).

2.3 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Roofing Asphalt: ASTM D 312, Type IV, hot-melt asphalt.
1. Softening Point, min/max, ASTM D 36: 215-225 deg. F (102-107 deg. C).
 2. Penetration at 77 deg. F (25 deg. C), min/max, ASTM D 5: 15-30 dmm.
 3. Flash point, minimum, ASTM D 92: 525 deg. F (274 deg. C).
 4. Ductility at 77 deg. F (25 deg. C), minimum, ASTM D 113: 2.5 cm.
- 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, nonskinning, and nondrying.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
- F. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.
- G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening substrate board to roof deck.

2.4 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.
- A. Cover Board: Substrate Board: ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, 1/4 inch (13 mm) thick.
 - 1. Basis of Design Product: Subject to compliance with requirements, provide USG Corporation; Securock. Gypsum Fiber Board.
- B. INSULATION ACCESSORIES
- C. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- E. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Hot-applied asphalt adhesive.
- F. Insulation Cant Strips: ASTM C 728, perlite insulation board.
- G. Wood Nailer Strips: Comply with requirements in Section 061053 "Miscellaneous Rough Carpentry."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."
4. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16-inch out of plane relative to adjoining deck.

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 INSTALLATION, GENERAL

- A. Comply with roofing system manufacturer's written instructions.
- B. Asphalt Heating: Heat and apply SEBS-modified roofing asphalt according to roofing system manufacturer's written instructions.
- C. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.4 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Global's "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.
 2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.5 INSULATION INSTALLATION

- A. Install one lapped base-sheet course and mechanically fasten to substrate according to roofing system manufacturer's written instructions.
- B. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing system with vertical surfaces or angle changes greater than 45 degrees.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.

- D. Install insulation with long joints of insulation in a continuous straight line, with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- E. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
- F. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- H. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten first layer of insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
 - 2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
 - 3. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
- I. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck. Tape joints if required by roofing system manufacturer.
 - 1. Fasten cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
 - 2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.6 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and as follows:
 - 1. Adhering Method: M (mopped).
 - 2. Number of Glass-Fiber Base-Ply Sheets: Two.
 - 3. Number of SBS-Modified Asphalt Sheets: One.
 - 4. Surfacing Type: M (mineral-granule-surfaced cap sheet).
- B. Coordinate installation of roofing system so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.7 BASE-PLY SHEET INSTALLATION

- A. Install glass-fiber base-ply sheets according to roofing system manufacturer's written instructions starting at low point of roofing system. Align glass-fiber base-ply sheets without stretching. Extend sheets over and terminate beyond cants.
 1. Shingle side laps of glass-fiber base-ply sheets uniformly to ensure that required number of glass-fiber base-ply sheets cover substrate at any point. Shingle in direction to shed water.
 2. Embed each glass-fiber base-ply sheet in a continuous void-free mopping of hot roofing asphalt to form a uniform membrane without glass-fiber base-ply sheets touching.

3.8 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

- A. Install modified bituminous roofing 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. Adhere to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F.
 2. Unroll roofing sheets and allow them to relax for minimum time period required by manufacturer.
- 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.

3.9 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. Backer-Sheet Application: Adhere backer sheet to substrate in a solid mopping of hot roofing asphalt.

3. Flashing-Sheet Application: Adhere flashing sheet to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F (218 deg C). Apply hot roofing asphalt to back of flashing sheet if recommended by roofing system manufacturer.
- B. Extend base flashing up walls or parapets a minimum of 8 inches (200 mm) above roofing membrane and 6 inches (100 mm) onto field of roofing membrane.
- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
 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.

3.10 FIELD QUALITY CONTROL

- A. Test Cuts: Remove test specimens to evaluate problems observed during quality-assurance inspections of roofing membrane as follows:
 1. Determine approximate quantities of components within roofing membrane according to ASTM D 3617.
 2. Examine test specimens for interply voids according to ASTM D 3617 and to comply with criteria established in Appendix 3 of ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
 3. Repair areas where test cuts were made according to roofing system manufacturer's written instructions.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
 1. Notify Architect and Owner 48 hours in advance of date and time of inspection.
- C. Roofing system will be considered defective if it does not pass tests and inspections.
 1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.11 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.

LEAVENWORTH INTERMEDIATE CENTER
LEAVENWORTH, KANSAS

12-18101-00
BID SET

END OF SECTION 075216

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 roof-drainage sheet metal fabrications.
2. Formed low-slope roof sheet metal fabrications.
3. Formed wall sheet metal fabrications.

- B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

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 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. 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 1-1/2 inches per 12 inches (1:10).

C. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of coping and roof edge flashing that is FM Approvals approved.
- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.7 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 FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

1.8 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.

1.9 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: 20 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 NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- D. SPRI Wind Design Standard: Manufacture and install copings, roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 - 1. Design Pressure: As indicated on Drawings.
- E. 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

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. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 (Z275) coating designation; prepainted 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 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.
 - 1) Color: To match Centria; 9967 XL Pewter.
 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 (0.013 mm).
- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed; with smooth, flat surface.
 1. Finish: 4 (polished directional satin).

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

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 or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

- a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. 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.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Solder:
1. For Stainless Steel: ASTM B 32, Grade Sn96, 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, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) 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.

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 (6 mm in 6 m) on slope and location lines indicated on

Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- J. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.
 - 1. Fabricated Hanger Style: Fig 1-35B according to SMACNA's "Architectural Sheet Metal Manual."
 - 2. Size: 4-inch by 3-inch.
 - 3. Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch (0.56 mm) thick.
- B. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper. Fabricate from the following materials:
 - 1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

- C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight.

1. Coping Profile: Fig 3-4A according to SMACNA's "Architectural Sheet Metal Manual."
2. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, concealed backup plate.
3. Fabricate from the Following Materials:

a. Galvanized Steel: 0.040 inch (1.02 mm) thick.

4. Cleat: Galvanized Steel: 0.052 inc (1.32 mm) thick.

- B. Counterflashing: Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch (0.56 mm) thick.

- C. Sill Flashing: Fabricate from the following material:

1. Coil-Coated Galvanized Steel: 0.0396 inch (1.0 mm) thick.

- D. Flashing Receivers: Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch (0.56 mm) thick.

- E. Roof-Penetration Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

- F. Roof-Drain Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.016 inch (0.40 mm) thick.

- G. Equipment Support Flashing: Fabricate from the following material:

1. Coil-Coated Galvanized Steel: 0.0276 inch (0.7 mm) thick.

2.8 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend beyond wall openings as indicated. Form head and sill flashing with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
1. Galvanized Steel: 0.022 inch (0.56 mm) thick.

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. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).
- 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. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.

4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 5. Torch cutting of sheet metal flashing and trim is not permitted.
 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or 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 (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- 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. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- 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 (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not use torches for soldering.
 2. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 3. 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.

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. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints.
 - 1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
 - 2. Provide elbows at base of downspout to direct water away from building.
 - 3. Connect downspouts to underground drainage system.
- C. Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
 - 1. Anchor scupper closure trim flange to exterior wall and solder or seal with elastomeric sealant to scupper.
 - 2. Loosely lock front edge of scupper with conductor head.
 - 3. Solder or seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.
- D. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch (25 mm) below scupper discharge.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, 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. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend

counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints minimum of 4 inches (100 mm). Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.

- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 042000 "Unit Masonry."
- C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

3.7 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.
- B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.8 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.9 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.

END OF SECTION 076200

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Roof hatches.

- B. Related Sections:

- 1. Section 055000 "Metal Fabrications" for metal vertical ladders and ships' ladders for access to roof hatches.
- 2. Section 055213 "Pipe and Tube Railings" for safety railing systems not attached to roof-hatch curbs.
- 3. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.3 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory.

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: For roof accessories.

- 1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

- C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - 1. Size and location of roof accessories specified in this Section.
 - 2. Method of attaching roof accessories to roof or building structure.
 - 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
 - 4. Required clearances.
- B. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 ROOF HATCH

- A. Roof Hatches: Metal roof-hatch units with lids and insulated single-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Babcock-Davis.
 - b. Bilco Company (The).
 - c. Bristolite Skylights.
 - d. Dur-Red Products.
 - e. J. L. Industries, Inc.
 - f. Metallic Products Corp.
 - g. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
 - h. Nystrom.
 - i. O'Keeffe's Inc.
- B. Type and Size: Single-leaf lid, 30 by 36 inches (750 by 900 mm).
- C. Loads: Minimum 40-lbf/sq. ft. (1.9-kPa) external live load and 20-lbf/sq. ft. (0.95-kPa) internal uplift load.
- D. Hatch Material: Aluminum sheet, 0.090 inch (2.28 mm) thick.
1. Finish: Clear anodic.
- E. Construction:
1. Insulation: Polyisocyanurate board.
 2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
 3. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
 4. Fabricate curbs to minimum height of 12 inches (300 mm) unless otherwise indicated.
- F. Hardware: Galvanized-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
1. Provide two-point latch on lids larger than 84 inches (2130 mm).
- G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
1. Height: 42 inches (1060 mm) above finished roof deck.
 2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches (31 mm) in diameter or galvanized-steel tube, 1-5/8 inches (41 mm) in diameter.
 3. Flat Bar: Galvanized steel, 2 inches (50 mm) high by 3/8 inch (9 mm) thick.

4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches (533 mm) in diameter.
5. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
6. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
7. Provide weep holes or another means to drain entrapped water in hollow section of handrail and railing members.
8. Fabricate joints exposed to weather to be watertight.
9. Fasteners: Manufacturer's standard, finished to match railing system.
10. Finish: Manufacturer's standard.
 - a. Color: As selected by Architect from manufacturer's full range.

2.3 METAL MATERIALS

- A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), manufacturer's standard allow for finish required, with temper to suit forming operations and performance required.
 1. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- B. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), manufacturer's standard alloy and temper for type of use, finished to match assembly where used, otherwise mill finished.
- C. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.
- D. Steel Tube: ASTM A 500, round tube.
- E. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123/A 123M.
- F. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.
- C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWWA C2; not less than 1-1/2 inches (38 mm) thick.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- E. Underlayment:

1. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
 2. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
 3. Slip Sheet: Building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum, rosin sized.
 4. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 5. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- G. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- H. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
1. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof-Hatch Installation:
1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
 2. Attach safety railing system to roof-hatch curb.
 3. Attach ladder-assist post according to manufacturer's written instructions.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Through-penetration firestop systems as specified in this Section may include both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items. The areas requiring through-penetration firestop systems may include the following:
 - 1. Penetrations through fire-resistance-rated walls and partitions.
 - 2. Penetrations through construction enclosing compartmentalized areas.
 - 3. Sealant joints in fire-resistance-rated construction.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 033000 "Cast-In-Place Concrete" for construction of openings in concrete slabs.
 - 2. Section 042000 "Unit Masonry" for joint fillers for non-fire-resistive-rated masonry construction.
 - 3. Section 072100 "Thermal Insulation" for safing insulation and accessories.
 - 4. Section 079200 "Joint Sealants" for non-fire-resistive-rated joint sealants.
 - 5. Division 22 and 23 Sections specifying ducts and piping penetrations.
 - 6. Division 26, 27 and 28 Sections specifying cable and conduit penetrations.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide through-penetration firestop systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
- B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:
 - 1. Where firestop systems protect penetrations located outside of wall cavities.
 - 2. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.

3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
 4. Where firestop systems protect penetrating items larger than a 4 inch (100 mm) diameter nominal pipe or 16 sq. in. (100 sq. cm) in overall cross-sectional area.
- D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per UL 2079, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- E. For through-penetration firestop exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- F. For through-penetration firestop exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

1.4 CONDITIONS OF CONSTRUCTION REQUIRING THROUGH-PENETRATION FIRESTOP SYSTEMS

- A. Provide through-penetration firestop systems for conditions specified, whether or not through-penetration firestop is indicated in the contract documents, and if indicated, whether such material is designed as insulation, safing, or otherwise. It shall not be assumed that all conditions described herein exist on this project.
1. Insulation types specified in other Sections of these specifications shall not be installed in lieu of the through-penetration firestop materials specified herein.
- B. Interior Walls and Partitions:
1. Where a wall or partition is continuous past a structural floor such as a stairwells and vertical shafts, and a space would otherwise remain open between the wall face and perimeter edge of the adjoining structural floor, provide through-penetration firestop to maintain the fire-rating of the assemblies.
 2. Through-penetration firestop shall be provided whether or not there are any clips, angles, plates or other members bridging or interconnecting the wall and floor systems and whether or not such items are continuous.
 3. Where the top edge of a fire-rated wall or partition abuts and is at right angles to a fluted-type metal decking or slab, and the construction is such that it would otherwise leave the flutes or gap spaces open, provide through-penetration firestop to maintain the fire rating of the assemblies.
- C. Penetrations:
1. Penetrations requiring through-penetration firestop treatments include, but are not limited to, conduit, cable trays, pipe, ductwork or any other elements passing through one or both outer surfaces of a fire-rated wall or partition.

2. Where penetrations occur at fire-rated walls or partitions of solid-type construction, provide through-penetration firestop to completely fill the spaces around that penetration on each side of the wall or partition in accordance with ASTM E 814.
 3. Where penetrations occur at fire-rated walls or through-penetration firestop to completely fill the spaces around that penetration on each side of the wall or partition in accordance with ASTM E 814.
 4. The foregoing requirements for penetration through-penetration firestop shall apply whether or not sleeves have been provided and whether or not the penetrations are to be fitted with escutcheons or other trim assemblies. If penetrations are sleeved, firestop the annular space, if any, between the sleeve and the wall opening.
- D. Provide through-penetration firestop to fill the miscellaneous voids and openings in fire-rated construction in a manner consistent with the methodologies described herein.

1.5 SUBMITTALS

- A. Submit the following according to Conditions of Contract and Division 01 Specification Sections.
- B. Product data for each type of product specified.
 1. Certification by through-penetration firestop manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.
- C. Through-Penetration Firestops: Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
 1. Submit documentation, including description and illustrations of each proposed through-penetration firestop system to be used for the project, from a qualified testing and inspecting agency (i.e., UL Fire Resistance Directory) that is applicable to each through-penetration firestop 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 an engineering judgment illustrating the approved system with proposed modifications marked by through-penetration firestop manufacturer's fire protection engineer.
- D. Product certificates signed by manufacturers of through-penetration firestop products certifying that their products comply with specified requirements.

1.6 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide through-penetration firestop that complies with the following requirements and those specified under the "System Performance Requirements" article:

1. Through-penetration firestop tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
 2. Through-penetration Systems: 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 UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.
 3. Fire-resistive Joint Sealant Systems: Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per UL 2079. Provide systems complying with the following requirements:
 - a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
 - b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.
- B. Information on drawings referring to specific design designations of through-penetration firestop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require the Architect's prior approval. Submit documentation showing that the performance of proposed substitutions equals or exceeds that of the systems they would replace and are acceptable to authorities having jurisdiction.
- C. Installer Qualifications: Engage an experienced Installer who is certified, licensed, or otherwise qualified by the through-penetration firestop manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its through-penetration firestop products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
- D. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
- E. Provide through-penetration firestop products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."
- F. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 01 Sections.

- H. Owner will employ and pay a qualified inspection agency to check installed through-penetration firestop systems for compliance with requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop 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 through-penetration firestop materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.8 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install through-penetration firestop when ambient or substrate temperatures are outside limits permitted by through-penetration firestop manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilation: Ventilate through-penetration firestop per through-penetration firestop manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products manufactured by one of the following:
 1. Bio Fireshield Inc.
 2. Hilti, Inc.
 3. International Protective Coatings Corp.
 4. 3M Corp. (Dow Corning Corp. Products)
 5. Nelson Firestop Products
 6. The Rectorseal Corporation
 7. Specified Technologies, Inc.
 8. Tremco, Inc.

2.2 THROUGH-PENETRATION FIRESTOP, GENERAL

- A. Compatibility: Provide through-penetration firestop composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the through-penetration firestop under conditions of service and application, as demonstrated by through-penetration firestop manufacturer based on testing and field experience.

- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the through-penetration firestop manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems.
- C. Applications: Provide through-penetration firestop systems composed of materials specified in this Section that comply with system performance and other requirements.

2.3 MATERIALS

- A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality. Manufacturers listed as approved may submit a product for review where no product has been listed in the "Acceptable Products" paragraph. In the event an approved manufacturer markets a product in any given category with it feels is a more suitable through-penetration firestop product for any given situation, the manufacturer may submit this product for review.

2.4 MORTAR TYPE SEALS

- A. In general, mortar type seals may be used in through-penetration firestop systems that include large blank openings or openings containing multiple metal penetrations in concrete floor or roof slabs.
- B. Provide mortar seal materials which comply with the following:
 - 1. Water based mortar capable of expanding a minimum of 3 percent by volume.
 - a. Density: 38 to 42 pounds per cubic foot (dried mortar).
 - b. Thickness: Minimum 4-1/2 inches for a 3-hour rating, or as indicated on the Drawings, or if not indicated, as required for specified fire rating.
 - 2. Noncombustible.
 - 3. Class 1 surface spread of flame.
 - 4. Fire Resistance rating: 2 and 3 hours as required, tested in accordance with UL 1479.
 - 5. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hilti; FS 635 Trowelable Firestop Compound.
 - b. International Protective Coatings Corporation; KBS Mortar Seal MS 50.
 - c. Specified Technologies, Inc.; SpecSeal Firestop Mortar.
 - d. 3M Fire Protection Products; Fire Barrier Mortar.
 - e. Tremco, Inc.; TREMstop M.
 - 6. Accessory Materials:
 - a. Wall Penetration: Onside shuttered, using galvanized steel or Styrofoam panel flush with damming material to be removed after drying.
 - b. Floor Penetration, Retainers: Galvanized steel securing cups, holding damming board as recommended by manufacturer.

2.5 FIRESTOP COMPOUNDS

- A. In general, firestop compounds (caulk) may be used in through-penetration firestop systems which include metal pipe, metal conduit, multiple metal conduit, metal sprinkler pipe, and plastic jacketed cable through concrete floors/walls and gypsum walls; also insulated metal pipe through concrete walls/floors and gypsum walls.
1. Possible systems include the following:
 - a. CAJ 1000 Series.
 - b. CAJ 3000 Series.
 - c. CAJ 5000 Series.
 - d. WL 1000 Series.
 - e. WL 3000 Series.
 - f. WL 5000 Series.
- B. Provide firestop compound materials which comply with the following:
1. Water based intumescent compound, pourable, trowelable, fire-break material.
 - a. Thickness: 4 inches minimum, or as indicated on the Drawings, or if not indicated, as required for specified fire rating.
 2. Noncombustible.
 3. Class 1 surface spread of flame.
 4. Fire Resistance Rating: 2 and 3 hours as required, tested in accordance with UL 1479.
 5. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hilti; FS 635 Trowelable Firestop Compound, FS 657 Fire Block, CP680 Cast-In-Place Firestop Device, FS-One High Performance Firestop Sealant.
 - b. International Protective Coatings Corporation; Flamesafe FS500 and FS600.
 - c. Specified Technologies, Inc.; SpecSeal Firestop Sealant.
 - d. 3M Fire Protection Products; 3M Fire Barrier CP 25W B+ Caulk.
 - e. Tremco, Inc.; TREMstop IA.
 6. Accessory Materials:
 - a. Damming Panel: Use damming board as recommended by manufacturer or Type X gypsum board or Marinite I.
 - b. Retainers: Galvanized steel securing clips, holding damming board as recommended by manufacturer.
 - c. Bulk Ceramic Fiber: Ceramic fiber to dam smaller openings; resists fire and heat up to 3,000 deg F.

2.6 INTUMESCENT BANDS OR WRAP STRIPS

- A. In general, intumescent bands or wrap strips may be used in through-penetration firestop systems, possibly in conjunction with other through-penetration firestop materials, which include plastic pipes, insulated metal pipe in gypsum walls and bus bar in concrete floors/walls.

1. Possible Systems Include: CAJ 6000 Series, WL 5000 Series.
- B. Provide intumescent bands or wrap strip materials which comply with the following:
1. Wrap-strip intumescent material providing a minimum of 15X expansion, containing no water-soluble expansion ingredients.
 2. Noncombustible.
 3. Class 1 surface spread of flame.
 4. Fire Resistance Rating: 2 to 4 hours, as required, tested in accordance with UL 1479.
 5. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hilti; CP642 Firestop Jacket, CP643 Firestop Jacket, FS-One High Performance Intumescent Firestop Sealant, CP680 Cast-In-Place Firestop Device.
 - b. 3M Fire Protection Products; 3M Fire Barrier FS-195+ Wrap/Strip.
 - c. Specified Technologies, Inc.; SpecSeal Wrap-Strip.
 - d. Tremco, Inc.; TREMstop WS.
 6. Accessory Materials: Aluminum tape, galvanized steel restricting collar.

2.7 FIRESTOP PUTTY

- A. In general, firestop putty may be used in through-penetration firestop systems, possibly in conjunction with other through-penetration firestop materials, which include PVC/CPVC sprinkler lines through gypsum walls and cable trays through gypsum wallboard/ steel stud construction and bus bar through concrete walls/floors and metal conduit and jacketed cables through concrete or gypsum board construction.
1. Possible Systems Include the following: CAJ 6000 Series, WL 2000 Series, WL 4000 Series for cable trays.
- B. Provide firestop putty materials which comply with the following:
1. Moldable putty with one part, intumescent elastomer.
 2. Noncombustible.
 3. Class 1 surface spread of flame.
 4. Fire Resistance Rating: 1 to 3 hours as required, tested in accordance with UL 1479.
 5. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hilti; CP618 Firestop Putty Stick, FS 657 Fire Block.
 - b. 3M Fire Protection Products; Fire Barrier Moldable Putty+.
 - c. International Protective Coatings Corporation; Flamesafe FSP 1000 putty.
 - d. Specified Technologies, Inc.; SpecSeal Firestop Putty.
 - e. Tremco, Inc.; TREMstop FP.
- C. Cable Tray System: System shall be equal to 3M WL 4004 System and include Type CS-195+ Intumescent Sheet as fill, void or cavity material, CP 25WB+ Caulk applied to fill all interstices between cables and between cables and any wrap strips or cavity fill materials, or Type MPS-2+ Moldable Putty used in lieu of the caulk material.

2.8 FIRESTOP CAULKING

- A. In general, the endothermic firestop caulking specified in this Article may be used only in through-penetration firestop systems which include metal pipe in concrete construction.
- B. Provide firestop caulking materials which comply with the following:
 - 1. Water based, single-component, endothermic caulk.
 - 2. Noncombustible.
 - 3. Class 1 surface spread of flame.
 - 4. Fire Resistance Rating: 1 to 3 hours as required.
 - 5. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hilti; FS-One High Performance Intumescent Firestop Sealant.
 - b. Specified Technologies, Inc.; SpecSeal Firestop Sealant.
 - c. 3M Fire Protection Products; FireDam 150 Caulk.
 - d. Tremco, Inc.; TREMstop A.

2.9 CONSTRUCTION JOINT FIRESTOP CAULKING

- A. In general, construction joint firestop caulking may be used in through-penetration firestop systems which include construction joints and metal pipe penetrations where movement is anticipated. This system may be used for top-of-wall/ head-of-wall joints when construction joint is exposed to view.
 - 1. Possible Systems Include UL Systems: HWD Joint Treatment Systems.
- B. Provide construction joint firestop caulking materials which comply with the following:
 - 1. Single-component silicone gun grade elastomer.
 - 2. Noncombustible.
 - 3. Class 1 surface spread of flame.
 - 4. Fire Resistance Rating: 1 to 3 hours as required.
 - 5. Tested in accordance with UL 2079 and ASTM E 1399 for dynamic joint cycling.
 - 6. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hilti; CP672 Firestop Spray, CP601s Elastomeric Firestop Sealant, CP606 Flexible Firestop Sealant.
 - b. 3M Fire Protection Products; 3M Fire Barrier 2000+ and 2003 Silicone Sealant.
 - c. Tremco, Inc.; TREMstop Fyre Sil.

2.10 HEAD-OF-WALL JOINT FIRESTOP MATERIAL

- A. In general, head-of-wall joint firestop material may be used in through-penetration firestop systems which include sealing head-of-wall joints between fire-rated floors (concrete, fluted steel decks) and fire-rated walls (gypsum, concrete) when construction joint is concealed from view or it is determined by the Architect that appearance of the sprayed joint is not a problem.
 - 1. Possible Systems Include UL Systems: HWD Joint Treatment Systems.

- B. Provide head-of-wall joint firestop materials which comply with the following:
1. Water based, single-component sprayable firestop.
 2. Noncombustible.
 3. Class 1 surface spread of flame.
 4. Fire Resistance Rating: 1 to 2 hours as required.
 5. Tested in accordance with UL 2079 and ASTM E 1399 for dynamic joint cycling.
 6. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hilti; CP672 Firestop Spray.
 - b. 3M Fire Protection Products; 3M FireDam Spray.
 - c. Specified Technologies, Inc.; SpecSeal Acrylic Spray.

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 of through-penetration firestop. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing through-penetration firestop to comply with recommendations of through-penetration firestop manufacturer and the following requirements:
1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of through-penetration firestop.
 2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form release agents from concrete.
- B. Priming: Prime substrates where recommended by through-penetration firestop 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 from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from through-penetration firestop materials. Remove tape as soon as it is possible to do so without disturbing through-penetration firestop's seal with substrates.

3.3 INSTALLATION, GENERAL

- A. Installation of through-penetration firestop materials shall be performed by an applicator/installer qualified and trained by the manufacturer. Installation shall be performed in strict accordance with the manufacturer's detailed installation procedures.
- B. Apply through-penetration firestop material in accordance with the fire test reports, fire resistance requirements, acceptable sample installations and the manufacturer's recommendations.
- C. Coordinate all through-penetration firestop with the plumbing, mechanical, electrical and any other trades that may be affected to assure that all piping, conduits, cable trays and other items that penetrate fire-rated construction have been permanently installed prior to the installation of any through-penetration firestop materials. Schedule and sequence the work so as to assure that partitions and other constructions that would obscure or conceal the penetrations are not erected prior to the installation, inspection and approval of the through-penetration firestop systems.
- D. Dam Construction:
 - 1. Install dams when required to properly contain through-penetration firestop materials within openings and as required to achieve the required fire resistance ratings. Combustible damming materials must be removed after appropriate curing of the through-penetration firestop compounds. Noncombustible damming materials may be left as a permanent component of the approved firestop system.

3.4 INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
 - 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. Install any covering materials or finish as per design requirements and manufacturer's instructions.
 - 4. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

- D. All seals shall be inspected for proper installation, drying, curing, adhesion as appropriate for the materials and systems being used. Where necessary, repairs shall be made and repaired installations shall be reinspected.

3.5 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

- A. Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.6 FIELD QUALITY CONTROL

- A. All areas of work must be accessible until inspection by the applicable Code Authorities.
- B. Correct unacceptable firestops and provide additional inspection to verify compliance with this specification at no additional cost to the Owner.
 - 1. Identify damaged, improperly installed or re-entered seals for repair or modification.
 - 2. Modifications to penetrations shall be accomplished per the firestop material manufacturer's recommendations.
 - 3. Only materials used in the original seal and designated by the manufacturer as suitable for said repair shall be used for this purpose.
- C. Do not proceed to enclose through-penetration firestop with other construction until reports of approval by examinations are issued.

3.7 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of through-penetration firestop products and of products in which opening and joints occur.

- B. Protect through-penetration firestop during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop immediately and install new materials to produce through-penetration firestop complying with specified requirements.

END OF SECTION 078413

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Joints in or between fire-resistance-rated constructions.
- B. Provide fire-resistive joint systems as appropriate to each joint condition and for each type of fire-resistive wall or partition construction indicated on the drawings.
- C. Related Sections include the following:
 - 1. Section 078413 "Penetration Firestopping" for systems installed in openings in walls and floors with and without penetrating items.
 - 2. Section 079200 "Joint Sealants" for non-fire-resistive joint sealants.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.
- B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities indicated as determined by UL 2079.
 - 1. Load-bearing capabilities as determined by evaluation during the time of test.
- C. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to

authorities having jurisdiction that demonstrates compliance with requirements for each condition 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 Certificates: For each type of fire-resistive joint system, signed by product manufacturer.
- D. Qualification Data: For Installer.
- E. Field quality-control test reports.
- F. Evaluation Reports: Evidence of fire-resistive joint systems' compliance with ICBO ES AC30, from the ICBO Evaluation Service.
- G. Research/Evaluation Reports: For each type of fire-resistive joint system.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- C. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.
 2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance Requirements" Article and comply with the following:
 - a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.
 - b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer,

date of manufacture, lot number, shelf life, curing time, and mixing instructions for multi-component materials.

- B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify Owner's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers:
 - 1. 3M; Fire Protection Products Division.
 - 2. A/D Fire Protection Systems Inc.
 - 3. Grace, W. R. & Co. - Conn.
 - 4. Hilti, Inc.
 - 5. Johns Manville.
 - 6. Nelson Firestop Products.
 - 7. NUCO Inc.
 - 8. RectorSeal Corporation (The).
 - 9. Specified Technologies Inc.
 - 10. Tremco; Sealant/Weatherproofing Division.
 - 11. USG Corporation.

2.2 FIRE-RESISTIVE JOINT SYSTEMS

- 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 primers and 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.

- B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) 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."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.6 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.
- B. Wall-to-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: WW-D- 0000-0999.
2. Assembly Rating: 1 hour or 2 hours as indicated.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class I – 12.5 percent compression or extension.
5. L-Rating at Ambient: Less than 1 cfm/ft. (cu. m/s x m).
6. L-Rating at 400 deg F (204 deg C): Less than 1 cfm/ft. (cu. m/s x m).

C. Head-of-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: HW-D- 0000-0999.
2. Assembly Rating: 1 hour or 2 hours as indicated.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class I – 12.5 percent compression or extension.
5. L-Rating at Ambient: Less than 1 cfm/ft. (cu. m/s x m).
6. L-Rating at 400 deg F (204 deg C): Less than 1 cfm/ft. (cu. m/s x m).

END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Mildew-resistant joint sealants.
4. Latex joint sealants.

B. Related Requirements:

1. Section 042000 "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Section 088000 "Glazing" for glazing sealants.
3. Section 092900 "Gypsum Board" for sealing perimeter joints.
4. Section 321373 "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- C. Field-Adhesion-Test Reports: For each sealant application tested.
- D. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.6 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace 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 agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 799.
 - b. GE Advanced Materials - Silicones; UltraGlaze SSG4000.
 - c. May National Associates, Inc.; Bondaflex Sil 200 GPN.
 - d. Polymeric Systems, Inc.; PSI-631.
 - e. Schnee-Morehead, Inc.; SM5731 Poly-Glaze Plus.
 - f. Tremco Incorporated; Tremsil 600.
 - g. Pecora Corporation; 860.

2.3 URETHANE JOINT SEALANTS

- A. Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems; Sonolastic SL 1.
 - b. Bostik, Inc.; Chem-Calk 950.
 - c. May National Associates, Inc.; Bondaflex PUR 35 SL.
 - d. Pecora Corporation; Urexpam NR-201.

- e. Polymeric Systems, Inc.; Flexiprene 952.
- f. Schnee-Morehead, Inc.; Permathane SM7101.
- g. Sika Corporation. Construction Products Division; Sikaflex - 1CSL.
- h. Tremco Incorporated; Vulkem 45.

2.4 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; 898.
 - b. Tremco Incorporated; Tremsil 600.

2.5 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems; Sonolac.
 - b. Bostik, Inc.; Chem-Calk 600.
 - c. May National Associates, Inc.; Bondaflex 600.
 - d. Pecora Corporation; AC-20+.
 - e. Schnee-Morehead, Inc.; SM 8200.
 - f. Tremco Incorporated; Tremflex 834.

2.6 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Adfast.
 - b. Alcot Plastics Ltd.
 - c. BASF Corp. - Construction Chemicals.
 - d. Construction Foam Products; a division of Nomaco, Inc.

- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, 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. Porous joint substrates include the following:
 - a. Concrete.

- b. Masonry.
- 3. Remove laitance and form-release agents from concrete.
- 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
 4. Provide flush joint profile where indicated according to Figure 8B in ASTM C 1193.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.
 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory.

Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between precast concrete panels.
 - c. Control and expansion joints in unit masonry.
 - d. Joints at cast stone units.
 - e. Joints between metal panels.
 - f. Joints between different materials listed above.
 - g. Perimeter joints between materials listed above and frames of doors, windows and louvers.
 - h. Control and expansion joints in ceilings and other overhead surfaces.
 - i. Other joints as indicated.
 - 2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 25.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - c. Other joints as indicated.
 - 2. Urethane Joint Sealant: Single component, pourable, traffic grade.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Vertical joints on exposed surfaces of interior unit masonry, concrete walls and partitions.
 - e. Joints on underside of plant-precast structural concrete beams and planks.
 - f. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
 - g. Other joints as indicated.
 2. Joint Sealant: Latex.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Sealant Location:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated.
 2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 079500 - EXPANSION CONTROL

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. Architectural joint systems for building interiors.
 - 2. Architectural joint systems for building exteriors.
- B. Related Sections include the following:
 - 1. Section 042000 "Unit Masonry" for masonry wall joint systems.
 - 2. Section 079200 "Joint Sealants" for liquid-applied joint sealants.
 - 3. Section 092900 "Gypsum Board" for gypsum board wall joint systems.

1.3 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.

1.4 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.
- 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.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain architectural joint systems through one source from a single manufacturer.
- C. Product Options: Specifications indicate size, profiles, and dimensional requirements of architectural joint systems and are based on the specific systems indicated.
 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.6 COORDINATION

- A. Coordinate installation of exterior wall and soffit joint systems with roof expansion assemblies to ensure that wall transitions are watertight.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), Alloy 6061-T6 for sheet and plate.
 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. 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. 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.

2.2 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.

2.3 ARCHITECTURAL JOINT SYSTEMS FOR BUILDING INTERIORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the products specified in individual subparagraphs below as basis-of-design products or a comparable product by one of the following:
 - 1. Architectural Art Mfg., Inc.
 - 2. Balco, Inc.
 - 3. MM Systems Corporation.
 - 4. Watson Bowman Acme Corp.
- B. Wall-to-Wall and Wall-to-Corner Joint Systems, EJ-1 at Gyp Walls and Masonry Walls:
 - 1. Basis-of-Design Product: Construction Specialties, Inc., Thinline Series, Model FWS-200 and FWSC-200 as indicated on the Drawings.
 - 2. Type: Flush wall cover.
 - a. Exposed Metal: Aluminum.
 - 1) Finish: Manufacturer's standard finish.
 - b. Gasket Material: Santoprene.
 - 1) Color: As selected by Architect from manufacturer's full range.
- C. Ceiling-to-Ceiling and Ceiling-to-Wall Joint Systems, EJ-2:
 - 1. Basis-of-Design Product: Construction Specialties, Inc., Thinline Series, Model FCF-200 and FCFC-200.
 - 2. Type: Flush ceiling cover.
 - a. Exposed Metal: Aluminum.

- 1) Finish: Manufacturer's standard finish.
- b. Gasket Material: Santoprene.
 - 1) Color: White.

2.4 ARCHITECTURAL JOINT SYSTEMS FOR BUILDING EXTERIORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the products specified in individual subparagraphs below as basis-of-design products or a comparable product by one of the following:
 - 1. Architectural Art Mfg., Inc.
 - 2. Balco, Inc.
 - 3. MM Systems Corporation.
 - 4. Watson Bowman Acme Corp.
- B. Architectural Joint Systems for Exterior Walls, EJ-3:
 - 1. Basis-of-Design Product: Construction Specialties, Inc., Exterior Wall Covers, Model SF-200 Series for walls.
 - 2. Type: Flush wall cover.
 - a. Exposed Metal: Aluminum.
 - 1) Finish: Manufacturer's standard finish.
 - b. Gasket Material: Santoprene.
 - 1) Color: As selected by Architect from manufacturer's full range.
- C. Architectural Joint Systems for Roof-to-Roof and Roof-to-Wall, EJ-4:
 - 1. Basis-of-Design Product: Construction Specialties, Inc., Exterior Roof to Wall, Model RJT-200 and RJTW-200.
 - 2. Exposed Metal: Aluminum with manufacturer's standard finish.
 - 3. Secondary Seal: Continuous waterproof membrane attached to side of joint below the cover.
 - a. Insulation: 4 lb./c.ft. density, Type IV B mineral wool.

2.5 FINISHES

- 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: Noticeable variations in same piece are not acceptable.

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. 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.

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. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.
- C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
 - 1. Provide in continuous lengths for straight sections.
 - 2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
 - 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Terminate exposed ends of joint assemblies with field- or factory-fabricated termination devices.
- E. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.
- F. Splice secondary seals and splice to EPDM vapor retarder provided under Section 072726, to provide a continuous air and moisture barrier along the entire building expansion joint system.

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 seals prior to Substantial Completion of the Work.

END OF SECTION 079500

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.
3. Severe storm shelter hollow metal doors and frames.

- B. Related Requirements:

1. Section 042000 "Unit Masonry Assemblies" for building anchors into and grouting frames in masonry and drywall construction.
2. Section 081416 "Flush Wood Doors" for solid-core wood doors installed in steel frames.
3. Section 087100 "Door Hardware" for door hardware and weatherstripping.
4. Section 088000 "Glazing" for glass in steel doors and sidelights.
5. Section 099123 "Interior Painting" for field painting primed doors and frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation 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.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions and finishes.

- B. Shop Drawings: Include the following:
1. Elevations of each door type.
 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 electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 7. Details of anchorages, joints, field splices, and connections.
 8. Details of accessories.
 9. Details of moldings, removable stops, and glazing.
- C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.6 QUALITY ASSURANCE

- A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
1. Test Pressure: Test at positive-pressure according to NFPA 25A, UL 10C.
 2. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.
- C. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.
- D. Severe Storm Shelter Openings: Provide complete door systems for tornado storm shelters, and other areas of refuge, complying and tested according to FEMA 361, Second Edition (2008), Design and Construction Guidance for Community Safe Rooms; and ICC 500 (2008), ICC/NSSA Standard for the Design and Construction of Storm Shelters.
1. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to 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 doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

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. Steelcraft; an Ingersoll-Rand company.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Standard-Duty Doors and Frames: SDI A250.8, Level 1; SDI A250.4, Level C. At locations indicated in the Door and Frame Schedule.
 - 1. Doors:
 - a. Thickness: 1-3/4 inches (44.5 mm).
 - b. Face: Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.032 inch (0.8 mm).
 - c. Edge Construction: Model 1, Full Flush.
 - d. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 - 2. Frames:
 - a. Materials: Uncoated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Face welded.
 - 3. Exposed Finish: Prime.

2.3 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B. At locations indicated in the Door and Frame Schedule.
 - 1. Doors:
 - a. Thickness: 1-3/4 inches (44.5 mm).
 - b. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm), with minimum A40 (ZF120) coating.
 - c. Edge Construction: Model 2, Seamless.
 - d. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, Polyisocyanurate, mineral-board, or vertical steel stiffener core at manufacturer's discretion.
 - 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
 - b. Construction: Full profile welded.
 - 3. Exposed Finish: Prime.

2.4 HOLLOW METAL DOORS FOR SEVERE STORM SHELTERS

- A. General: Provide complete tornado or hurricane resistant door and frame shelter assemblies constructed to resist the design wind pressures for components and cladding and missile impact loads as described in ICC 500 - 2014, ICC/NSSA Standard for the Design and Construction of Storm Shelters. Only single opening and paired opening doors and their frames constructed to resist calculated design wind pressures and laboratory tested missile impacts are acceptable.
 - 1. Door systems, both single doors and paired openings, tested and complying with ICC 500 and FEMA 361 (2008), Design and Construction Guidance for Community Safe Rooms and supported by third party test results.
 - 2. Sheets fabricated on exterior openings from commercial quality hot dipped zinc coated steel complying with ASTM A924 A60. Gauges to be in accordance with manufacturers tested assemblies.
 - 3. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth.
 - 4. Beveled Lock Edge: 1/8 inch in 2 inches (3 mm in 50 mm).
 - 5. Top Edge: Reinforce top of doors with a continuous steel channel extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached and welded in place with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
 - 6. Hinge Reinforcement: Minimum 7 gauge (3/16 inch) plate 1-1/4 inches by 9 inches.

7. Include vision lites where indicated.
8. Basis-of-Design Product: Subject to compliance with requirements, provide Curries Company; 747 StormPro Series or comparable product by one of the following:
 - a. Ceco Door Products.
 - b. Curries Company.
 - c. Steelcraft.
 - d. Windsor Republic Builders Products.

2.5 HOLLOW METAL FRAMES FOR SEVERE STORM SHELTERS

- A. General: Subject to the same compliance standards and requirements as standard hollow metal frames, provide complete tornado door and frame assemblies, for both single doors and paired openings, tested and labeled as complying with ICC 500 and FEMA 361 and supported by third party test results.
 1. Fabricate exterior frames from 14 gauge hot dipped zinc coated steel that complying with ASTM designations A924 A60.

2.6 BORROWED LITES

- A. Fabricate of uncoated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
- B. Construction: Face welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.7 FRAME ANCHORS

- A. Jamb Anchors:
 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) 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.

2.8 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.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Glazing: Comply with requirements in Section 088000 "Glazing."

2.9 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Sidelite 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 welding.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Door Silencers: Except on weather-stripped frames, 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.

4. Terminated Stops: Terminate stops 6 inches (152 mm) above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
 5. Electrical Knock Out Boxes: Factory weld 18 gage electrical knock out boxes to frame for electrical hardware preps; this includes but not limited to electric thru wire hinges, electrical raceways, door position switches, electric strikes and magnetic locks as noted in door hardware sets in Section 087100 "Door Hardware" and Section 281300 "Access Control."
 - a. Electrical knock out boxes are required at door position switches, electric strikes and middle hinge locations for all exterior locations regardless of electrical hardware specified in Section 087100 "Door Hardware" and Section 281300 "Access Control."
 - b. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
 - c. Conduit to be coordinated and installed in the field from middle hinge box and strike box to door position box.
 - d. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Section 087100 "Door Hardware."
 - e. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Provide stops and moldings flush with face of door, and with beveled stops unless otherwise indicated.
 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. Provide loose stops and moldings on inside of hollow-metal doors and frames.
 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

2.10 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 - 2. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 - 4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 5. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:

- a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8, NAAMM-HMMA 841 and NAAMM-HMMA guide specification indicated.
- D. Fire-Rated Doors: Install with clearances specified in NFPA 80.
- E. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
- F. Hollow metal doors and frames for "severe storm shelters" shall be furnished and installed in accordance with FEMA P-361, Third Edition (2015) and ICC 500, Second Edition (2014) and manufacturer's written specifications.

3.3 CLEANING AND TOUCHUP

- A. 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.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- C. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.
- D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Solid-core doors with wood-veneer faces.
- 2. Factory finishing flush wood doors.
- 3. Factory fitting flush wood doors to frames and factory machining for hardware.

- B. Related Requirements:

- 1. Section 081113 "Hollow Metal Doors and Frames" for wood doors in steel frames.
- 2. Section 087100 "Door Hardware" for door hardware for flush wood doors.
- 3. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction 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; and the following:

- 1. Dimensions and locations of blocking.
- 2. Dimensions and locations of mortises and holes for hardware.
- 3. Dimensions and locations of cutouts.
- 4. Undercuts.
- 5. Requirements for veneer matching.
- 6. Doors to be factory finished and finish requirements.

- C. Samples for Verification:

- 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), 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 finished Work.
- 2. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 FIELD 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 ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
- B. 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 (16 and 32 deg C) and relative humidity between 25 and 55 percent during remainder of construction period.

1.7 WARRANTY

- A. A. Special Warranty: 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 (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) 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. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Graham; an Assa Abloy Group company.
4. Marshfield Door Systems, Inc.
5. Oshkosh Architectural Door Company.
6. VT Industries Inc.

2.2 FLUSH WOOD DOORS, GENERAL

- A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.
- B. Particleboard-Core Doors:
 1. Particleboard: ANSI A208.1, Grade LD-2.
 2. Blocking: Provide wood blocking in particleboard-core doors as follows:
 - a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
 - b. 5-inch (125-mm) bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
 - c. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
 3. Provide doors with glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
 1. Grade: Premium, with Grade A faces.
 2. Species: White birch.
 3. Cut: Plain-sliced.
 4. Match between Veneer Leaves: Book match.
 5. Assembly of Veneer Leaves on Door Faces: Balance 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.
 8. Exposed Vertical and Top Edges: Same species as faces.
 9. Core: Particleboard.
 10. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

2.4 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
 1. Wood Species: Same species as door faces.
 2. Profile: Flush rectangular beads.

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 NFPA 80 requirements 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, BHMA-156.115-W, 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: Factory cut and trim openings through doors.
 - 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. Factory finish doors.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: WDMA TR-6 catalyzed polyurethane.
 - 3. Staining: To match VT Industries Inc.; Clear CL07.
 - 4. Effect: Filled finish.
 - 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed 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 referenced quality standard.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

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

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:

- 1. Access doors and frames for walls and ceilings.
- 2. Security key box (Knox box).

- B. Related Requirements:

- 1. Section 042000 "Unit Masonry" for anchoring and grouting access door frames set in masonry construction.
- 2. Section 087100 "Door Hardware" for mortise or rim cylinder locks and master keying.
- 3. Division 23 Sections for heating and air-conditioning duct access doors.

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.

PART 2 - PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1. Access Doors:
 - a. J. L. Industries, Inc.
 - b. Karp Associates, Inc.
 - c. Larsen's Manufacturing Company.
 - d. Milcor Limited Partnership.
 - e. Nystrom Building Products Co.
 - f. Williams Bros. Corporation of America (The).

2.2 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Exposed Flanges:

1. Description: Face of door flush with frame, with exposed flange and concealed hinge.
2. Locations: Wall and ceiling.
3. Door Size: 2'-0" by 2'-0".
4. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage, factory primed.
5. Frame Material: Same material, thickness, and finish as door.
6. Latch and Lock: Cam latch, screwdriver operated.

2.3 SECURITY KEY BOX (KNOX BOX)

A. Building Access Security Key Box (Knox Box):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Knox Company; Model 3200 Series or approved equal.
 - a. Type: Small key and data storage cabinet with swing door, recessed mount with alarm tamper switch.
 - b. Location: As indicated on the Drawings. Verify installation location with local fire marshal prior to installation.
 - c. Color: Match aluminum storefront color.

2.4 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with 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), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines, or blend into finish.
- E. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063.
- F. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- G. Frame Anchors: Same material as door face.
- H. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.5 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- D. Latch and Lock Hardware:
 - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 - 2. Keys: Furnish two keys per lock and key all locks alike.

2.6 FINISHES

- 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: 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.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.
 - a. Color: As selected by Architect from full range of industry colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates 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. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113

SECTION 083313 - COILING COUNTER DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Coiling counter doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of coiling counter door and accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 - 2. Include rated capacities, operating characteristics, and furnished accessories.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
 - 4. Show locations of locking devices and other accessories.
- C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
 - 1. Curtain slats.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For coiling counter doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
 - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.
 - 1. Obtain operators and controls from coiling counter door manufacturer.

2.2 COUNTER DOOR ASSEMBLY

- A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ACME Rolling Doors.
 - b. C.H.I. Overhead Doors.
 - c. Clopay Building Products.
 - d. Cookson Company.
 - e. Cornell Iron Works, Inc.
 - f. McKeon Rolling Steel Door Company, Inc.
 - g. Overhead Door Corporation.
 - h. Raynor.
 - i. Wayne-Dalton Corp.
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 - 1. Include tamperproof cycle counter.
- C. Door Curtain Material: Stainless steel.
- D. Door Curtain Slats: Flat profile slats of 1-1/4-inch (32-mm) center-to-center height.
- E. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated aluminum extrusion and finished to match door.

- F. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- G. Hood: Match curtain material and finish.
 - 1. Shape: Square.
 - 2. Mounting: Face of wall.
- H. Sill Configuration: Refer to the Drawings.
- I. Locking Devices: Equip door with locking device assembly.
 - 1. Locking Device Assembly: Single-jamb side locking bars, operable from inside only with cylinders.
- J. Manual Door Operator: Push-up operation.
- K. Curtain Accessories: Equip door with astragal and push/pull handles.
- L. Door Finish:
 - 1. Stainless Steel Finish: No. 4 (polished directional satin).

2.3 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate coiling counter-door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
 - 1. Stainless-Steel Door Curtain Slats: ASTM A 666, Type 304; sheet thickness of 0.025 inch (0.64 mm); and as required.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.4 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
 - 1. Stainless Steel: 0.025-inch- (0.64-mm-) thick, stainless-steel sheet, Type 304, complying with ASTM A 666.

2.5 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: Cylinders standard with manufacturer.
 - 2. Keys: Three for each cylinder.

2.6 CURTAIN ACCESSORIES

- A. Astragal: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
- B. Push/Pull Handles: Equip each push-up-operated door with lifting handles on each side of door, finished to match door.

2.7 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.8 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Push-up Door Operation: Design counterbalance mechanism so that required lift or pull for door operation does not exceed 25 lbf (111 N).

2.9 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 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 grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Perform installation and startup checks according to manufacturer's written instructions.
 - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION 083313

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Exterior insulated service door.
- 2. Interior fire-rated service door.

- B. Related Sections:

- 1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.
- 2. Section 087100 "Door Hardware" for keyed control cylinders not specified in this Section.
- 3. Division 26 Sections for electrical service and connections for powered operators and accessories.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SE17.
 - 1. Component Importance Factor: 1.25.
- B. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
 - 1. Wind Loads: Uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa), acting inward and outward.
- C. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1.4 SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
 - 1. Construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 - 2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
 - 3. For fire-rated doors, description of fire-release system including testing and resetting instructions.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Show locations of replaceable fusible links.
 - 3. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
 - 1. Include similar Samples of accessories involving color selection.
- D. Qualification Data: For qualified Installer.
- E. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
 - 1. Obtain operators and controls from overhead coiling door manufacturer.
- C. 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 as close to neutral pressure as possible according to NFPA 252 or UL 10B.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch (0.71 mm) and as required to meet requirements.
 2. Insulation: Fill slats for exterior doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within slat faces.
 3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
 4. Gasket Seal: Provide insulated slats with manufacturer's standard interior-to-exterior thermal break or with continuous gaskets between slats.
- B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.
- C. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from manufacturer's standard hot-dip galvanized steel, stainless steel, or aluminum extrusions to match curtain slats and finish.
- D. Astragal for Interior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
- E. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.
- F. Operation Cycles: Not less than 10,000.
1. Include tamperproof cycle counter.
- G. STC Rating: 26.
- H. Fire Rating: As indicated on the Drawings.

2.2 DOOR ASSEMBLIES

- A. Fire-rated Interior Service Door and Exterior Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ACME Rolling Doors.
 - b. Alpine Overhead Doors, Inc.
 - c. AlumaTek, Inc.
 - d. C.H.I. Overhead Doors.
 - e. City-Gates.
 - f. Cookson Company.
 - g. Cornell Iron Works, Inc.
 - h. Dynamic Closures Corp.
 - i. Lawrence Roll-Up Doors, Inc.
 - j. Mahon Door Corporation.
 - k. McKeon Rolling Steel Door Company, Inc.
 - l. Metro Door.
 - m. Overhead Door Corporation.
 - n. QMI Security Solutions.
 - o. Raynor.
 - p. Southwestern Steel Rolling Door Co.
 - q. Wayne-Dalton Corp.
 - r. Windsor Door.

2.3 FIRE-RATED SERVICE DOOR AND INSULATED SERVICE DOOR

- A. Door Curtain Material: Galvanized steel.
- B. Door Curtain Slats: Flat profile slats of 1-1/4-inch (32-mm) center-to-center height.
 1. Insulated-Slat Interior Facing: Metal.
- C. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- D. Door Finish:
 1. Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 HOOD

- A. General: Square, form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
 1. Galvanized Steel: Nominal 0.028-inch- (0.71-mm-) thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.

2.5 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: As specified in Section 087100 "Door Hardware."
 - 2. Keys: As specified in Section 087100 "Door Hardware."
- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.6 CURTAIN ACCESSORIES

- A. Smoke Seals: Equip each fire-rated door with smoke-seal perimeter gaskets for smoke and draft control as required for door listing and labeling by a qualified testing agency.
- B. Weatherseals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.
 - 1. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous sheet secured to inside of hood.
 - 2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene.
- C. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
 - 1. Provide pull-down straps or pole hooks for doors more than 84 inches (2130 mm) high.
- D. Automatic-Closing Device for Fire-Rated Doors: Equip each fire-rated door with an automatic-closing device that is inoperative during normal door operations and that has a governor unit complying with NFPA 80 and an easily tested and reset release mechanism designed to be activated by the following:
 - 1. Replaceable fusible links with temperature rise and melting point of 165 deg F (74 deg C) interconnected and mounted on both sides of door opening.
 - 2. Manufacturer's standard UL-labeled heat detector and door-holder-release devices.
 - 3. Building fire-detection and -alarm systems and manufacturer's standard door-holder-release devices.

2.7 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall

thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

- C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.8 ELECTRIC DOOR OPERATORS AT ALL SERVICE DOORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Provide one of the following Door Operator locations for each door.
 - 1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
 - 2. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
 - 3. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
- D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements unless otherwise indicated.
 - 1. Electrical Characteristics:
 - a. Phase: Single phase.
 - b. Volts: 120V.
 - c. Hertz: 60.

2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.
 3. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
 4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Provide remote momentary key switch electronic control of electric door operators at all service doors.
 - a. Key Switch Cylinders: As specified in Section 087100 "Door Hardware."
 5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.
 2. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.
- G. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).
- H. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- I. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- J. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

- K. Door Position Contact Switches: Provide SPDT/DPDT type floor-mounted door position contact plate to monitor open/closed status at exterior service doors.

2.9 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 STEEL AND GALVANIZED-STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard powder-coat finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
 - 1. Color: As selected by the Architect from manufacturer's full range of colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Fire-Rated Doors: Install according to NFPA 80.
- E. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Perform installation and startup checks according to manufacturer's written instructions.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide weathertight fit around entire perimeter.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Storefront framing.
- 2. Manual-swing entrance doors.
- 3. Horizontal sun shades.

- B. Related Requirements:

- 1. Section 079200 "Joint Sealants" for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
- 2. Section 087100 "Door Hardware" for hardware to the extent not specified in this Section, and access control and activating signaling systems.
- 3. Section 088000 "Glazing" for glazing requirements to the extent not specified in this Section.
- 4. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators installed on frames with factory installed electrical knock-out boxes.
- 5. Division 28 Sections for access control.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: For aluminum-framed entrances and storefronts; and horizontal sun shades. Include plans, elevations, sections, full-size details, and attachments to other work.

- 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.

2. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
 4. Include point-to-point wiring diagrams showing the following:
 - a. Power requirements for each electrically operated door hardware.
 - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
 1. Joinery, including concealed welds.
 2. Anchorage.
 3. Expansion provisions.
 4. Glazing.
 5. Flashing and drainage.
- F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- G. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer and field testing agency.
- 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 a qualified testing agency.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.
- B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- 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, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
 - 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), 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 to less than 1/8 inch (3.2 mm).
 - a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
- E. Structural: Test according to ASTM E 330/E 330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
 2. Entrance Doors:
 - a. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
- H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
 2. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- I. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K) as determined according to NFRC 100.
 2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas as a system shall have SHGC of no greater than 0.35 as determined according to NFRC 200.
 3. Condensation Resistance: Fixed glazing and framing areas as a system shall have an NFRC-certified condensation resistance rating of no less than 15 as determined according to NFRC 500.
- J. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows:
1. Outdoor-Indoor Transmission Class: Minimum 30.

- K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
 - b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
 - c. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

2.3 STOREFRONT SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer North America; an Alcoa company; 451-T CG Screw Splines for typical storefront systems and Encore Framing System for the round storefront system or a comparable product by one of the following:
1. Arch Aluminum & Glass Co., Inc.
 2. EFCO Corporation.
 3. Oldcastle BuildingEnvelope™.
 4. Pittco Architectural Metals, Inc.
 5. Tubelite Inc.
 6. YKK AP America Inc.
 7. Manko Window Co.
 8. Traco
- B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Exterior Framing Construction: Thermally broken.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Center.
 4. Finish: Clear anodic finish.
 5. Fabrication Method: Field-fabricated stick system.
 6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 7. Steel Reinforcement: As required by manufacturer.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.
1. Door Construction: 2-inch (50.8-mm) overall thickness, with minimum 0.188-inch- (4.8-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 2. Door Design: Wide stile; 5-inch (127-mm) nominal width.
 3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."
- 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.
- C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- D. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (12.7 mm).

2.6 HORIZONTAL SUN SHADES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer North America; an Alcoa company; Versoleil SunShade-Outrigger System for Storefronts or a comparable product by one of the following:
1. Arch Aluminum & Glass Co., Inc.
 2. EFCO Corporation.
 3. Oldcastle BuildingEnvelope™.
 4. Pittco Architectural Metals, Inc.
 5. Tubelite Inc.
 6. YKK AP America Inc.
 7. Manko Window Co.
 8. Traco.

- B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Size: 30-inches (762 mm) depth, compatible with storefront framing.
 - 2. Blade Profile: Airfoil louver shape.
 - 3. Fascia: Rectangular.
 - 4. Outrigger Arm: Manufacturer's standard.

2.7 GLAZING

- A. Glazing: Comply with 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.
- C. Glazing Sealants: As recommended by manufacturer.
- D. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
 - 1. Color: Match structural sealant.

2.8 MATERIALS

- A. Sheet and Plate: ASTM B 209 (ASTM B 209M).
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
- C. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
- D. Structural Profiles: ASTM B 308/B 308M.
- E. Steel Reinforcement:
 - 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.
 - 4. Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

2.9 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 exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.
- E. Rigid PVC Filler.

2.10 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
 2. Accurately fitted joints with ends coped or mitered.
 3. Physical and thermal isolation of glazing from framing members.
 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 5. Provisions for field replacement of glazing from interior.
 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Storefront Framing: Fabricate components for assembly using shear-block system.
- F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At interior and exterior doors, provide compression weather stripping at fixed stops.
- 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.

2.11 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.12 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations, including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 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 and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 088000 "Glazing."

G. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to 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.

3.4 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 (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).

- b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
 - c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of two tests in areas as directed by Architect.
 - b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
- C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.6 MAINTENANCE SERVICE

- A. Entrance Door Hardware:
 1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
 2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION 084113

SECTION 084333.13 – FEMA-361 ARCHITECTURAL WIND AND IMPACT RESISTANT
ALUMINUM FRAMING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

- A. Impact and wind resistant aluminum storefront framing.

1.3 ACTION SUBMITTALS

- A. Refer to Division 01 for Submittal Procedures.
- B. Product Data: For each type of framing and glazing including manufacturer recommended installation instructions.
- C. Shop Drawings: Include plans, elevations, sections, details, attachment to other work and glazing details for field-glazed units.
- D. Samples: For each exposed finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Indicating compliance with requirements.
- B. Warranty: Sample of finish warranty.
- C. Delegated Design: For assembly indicated to comply with performance requirements and design criteria, including structural calculations signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Special Inspection Report: As indicated in Code-Required Special Inspections and Procedures.

1.5 CLOSEOUT SUBMITTALS

- A. As required by Architect.
- B. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Mock-up: Install framing assembly at project site. Obtain Architect's approval prior to proceeding with installation of remaining storefront. Accepted mock-up may remain as portion of final work.

1.7 WARRANTY

- A. Framing: Manufacturer's warranty against defects in material and workmanship under normal use for a period of 1 year from the date of invoice.
- B. Finish Warranty: Manufacturer's warranty against deterioration of factory finishes for the period of ten (10) years from the date of invoice.
- C. Glass Warranty: Manufacturer's warranty against defects in material and workmanship resulting in edge separation or delamination for a period of five (5) years from the date of invoice.

PART 2 - PRODUCTS

2.1 FRAMING

- A. Basis of Design Product: Subject to compliance with requirements, provide Protective Structures; StormDefend™ SD-TH600 Aluminum FEMA Tornado Window Framing System; phone 888-521-8666; e-mail info@protectivestructures.com; website www.protectivestructures.com or comparable product by one of the following:
 - 1. Survivalite Impact Systems.
- B. Description:
 - 1. Factory fabricated framing constructed from either 6005-T5 or 6105-T5 extruded aluminum with integral weep design to allow water to vent to the exterior along horizontal members.
 - 2. Dimensions:
 - a. Head, Jamb, Sill, Mullion and Intermediate Horizontal Members: 2-1/2 inches by 6 inches.

2.2 GLAZING

- A. Glazing Material: Insulating Glass Clad Polycarbonate.
 - 1. Wind and Impact Laminated Insulating Units: TOR-GARD NBR-IG (clear).

2.3 PERFORMANCE CRITERIA

- A. Indicated areas of this project have been designed for occupancy as a storm shelter. The Work identified in this Section is a component of that security occupancy as follows:
 - 1. Type of Shelter: Tornado.
- B. Shelter Design Wind Speeds:
 - 1. Tornado 250 mph.
- C. Debris Hazard:
 - 1. FEMA 361 Compliant: Pass missile-impact tests according to P-361, 2015/ICC 500-2014 in accordance with:
 - a. ASTM E1886 – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
 - b. ASTM E1996 – Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
 - 2. Tornado: Resists impact of a 15-pound 2-by-4 at 100 mph.
- D. Pressure Testing:
 - 1. FEMA P-361, 2015 Compliant: Pass static pressure tests and cyclic tests according to FEMA P-361, 2015/ICC 500-2014 in accordance with:
 - a. ASTM E1886 – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Missiles and Exposed to Cyclic Pressure Differentials.

2.4 FABRICATION

- A. Tolerances: All joints and connections shall be tight, providing hairline joints and true alignment of adjacent members.

2.5 FRAMING FINISH

- A. Factory-applied finish:
 - 1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.6 ACCESSORIES

- A. Anchors: Fully concealed in accordance with requirements of delegated design requirements.

1. Steel extension anchor plates as required by delegated design.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify field dimensions of opening prior to fabrication of windows.
- B. Prepare openings to be in tolerance, plumb, level, provide for secure anchoring, and in accordance with approved shop drawings.
- C. Coordinate structural requirements to ensure proper attachment and support.

3.2 INSTALLATION

- A. Install windows in accordance with manufacturer's recommendations and approved shop drawings
- B. Provide required support and securely fasten and set windows plumb, square, and level without twist or bow.
- C. Apply sealant per window and sealant manufacturer's recommendations at all specified areas as shown on shop drawings and detailed in installation instructions. Wipe off excess, and leave exposed sealant surfaces clean and smooth.

3.3 ADJUSTING AND CLEANING

- A. Leave windows clean and free of construction debris. Strictly adhere to the manufacturer's recommended cleaning and maintenance instructions.

3.4 PROTECTION

- A. Protect window glazing and frames from damage during subsequent construction activities. If damage occurs, remove and replace as required at no additional cost to the Owner to provide windows in their original, undamaged condition.

END OF SECTION 084333.13

SECTION 087100 - DOOR HARDWARE

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. Intent: The intent of this Section is to provide finish hardware for the proper operation and control of all wood, hollow metal and aluminum doors in the Project. Prior to bidding, notify the Architect of any doors that do not have hardware meeting this intention.
- B. The hardware supplier will be responsible to furnish correct hardware on labeled doors to satisfy State and Local Building Codes.
- C. Should items of hardware, not definitely specified, be required for completion of work, furnish such items of type and quality suitable to the services required and comparable to the adjacent hardware.
- D. This Section includes known commercially, as finish or door hardware that are required for swing, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed. This Section includes, but is not necessarily limited to furnishing and installing complete, the following:
 - 1. Finish hardware for proper operation, function, control and protection of all doors, as required.
- E. Related work in other sections:
 - 1. Section 081113 "Hollow Metal Doors and Frames" for hollow metal doors, frames and silencers.
 - 2. Section 081416 "Flush Wood Doors" for wood doors.
 - 3. Section 084113 "Aluminum-Framed Entrances and Storefronts for aluminum doors.

1.3 SUBMITTALS

- A. Comply with requirements of the Conditions of the Contract and Division 01 Sections.
- B. Product Data: Submit manufacturer's technical product data for each hardware item. Include information necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finishes.

- C. Hardware Schedule: Submit a hardware schedule in a vertical format (horizontal format not acceptable), organized into sets, including the information below. Designations for door numbers and hardware sets in the schedule shall match those used in the Construction Documents.
1. Hardware Schedule shall be coordinated with doors, frames, and related work to ensure proper size, thickness, hand function, and finish of door hardware. Provide index at end of submittal listing door and specified hardware. In addition, indicate page on submittal where door is found.
 2. Catalog cuts of each type of exposed hardware unit, highlighted in color to indicate compliance with the Hardware Schedule and PACS equipment.
 - a. Type, style, function, size and finish of each hardware or PACS item.
 - b. Name and manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Explanation of all abbreviations, symbols, codes, etc., contained in schedule.
 - e. Mounting locations for hardware.
 - f. Door and frame sizes and materials.
 - g. Deviations from Specifications shall be noted in cover letter.
- D. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames), which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.
- E. Keying Schedule: Submit separate detailed schedule indicating keying for all locks. Keying schedule must be approved before ordering any locks.
- F. Templates: Furnish hardware templates to each fabricator of doors, frames and other work. To be factory prepared for the installation of hardware: Upon request check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

1.4 QUALITY ASSURANCE

- A. Supplier Qualifications: A recognized Architectural Finish Hardware Supplier, with warehousing facilities, who has been furnishing hardware in the Project's vicinity for a period of not less than two (2) years. Supplier shall be or employ an experienced Architectural Hardware Consultant (AHC) who is certified by and member of the Door and Hardware Institute. The Architectural hardware Consultant shall be available, at reasonable times during the course of the work, for consultation about Project's hardware requirements, to Owner, Architect and Contractor.
- B. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80, No. 101 and local building code requirements. Provide only hardware, which has been tested and listed, by UL, FM or Warnock Hersey for types and sizes of doors required and complies with requirements of door and door frame labels.

1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware".
- C. Standards: Comply with the requirements of the latest edition of the following standards, unless indicated otherwise:
 1. American National Standards Institute (ANSI) Publications:
 - a. A115 Series - Door and Frame Preparation
 - b. A156 Series -Hardware
 2. Builders Hardware Manufacturers Association (BHMA) Publications:
 - a. 1201- Auxiliary Hardware
 - b. 1301 - Materials and Finishes
 3. Door and Hardware Institute (DHI) Publications:
 - a. Keying - Procedures, Systems, and Nomenclature
 - b. Abbreviations and Symbols
 - c. Hardware for Labeled Fire Doors
 - d. Recommended Locations for Builder's Hardware for Standard and Custom Steel Doors and Frames
 - e. Wood Door Standards W1, W2, WDHS-2 WDHS-3
 4. National Fire Protection Association (NFPA) Publications:
 - a. NFPA Pamphlet No. 80 - Standards for Fire Doors and Windows.
 - b. NFPA Pamphlet No. 101.
 5. International Building Code - 2009 Edition.
 6. Americans with Disabilities Act (ADA).

1.5 DELIVERIES, STORAGE AND HANDLING

- A. Package each hardware item in separate containers with all screws, wrenches, installation instructions and installation templates. Mark each box with hardware heading and door number according to approved hardware schedule.
- B. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation: Provide a complete packing list showing items, door numbers and hardware headings with each shipment.
- C. Store hardware in shipping cartons above ground and under cover to prevent damage. Provide secure lockup for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable -so that completion of the Work will not be delayed by hardware losses both before and after installation.

- D. Aluminum Door Hardware: Deliver hardware for aluminum doors as directed by the door supplier.

PART 2 - PRODUCTS

2.1 HARDWARE - GENERAL

- A. Provide the materials or products indicated by trade names, manufacturer's name, or catalog number. Substitutions will not be permitted except as described in Division 01.
- B. Provide manufacturer's standard products meeting the design intent of this Specification, free of imperfections affecting appearance or serviceability.
 - 1. Provide hardware complete with all fasteners, anchors, instructions, layout templates, and any specialized tools as required for satisfactory installation and adjustment.
 - 2. Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
 - 3. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated or approved. Finish screws exposed under any condition to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible. Use machine screws for metal connections and wood screws for connections to wood. Use manufacturer's screws to secure hardware.
 - 4. Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners. Do not use through bolts for installation where bolt, head or nut on opposite face is exposed in other work, except where indicated otherwise or where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each through bolt or use sex screw fasteners.
 - 5. Special Tools: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of finish hardware.
- C. Hardware is specified in the hardware schedule by set, type, and functions, which have been selected as best meeting the application requirements. Acceptable products for each category are specified in Paragraph 2.5, "Hardware Products".

2.2 SPECIAL REQUIREMENTS

- A. Hinges:
 - 1. Provide non-removable pins for all exterior doors. Use nonrising pins for all other doors. Provide continuous hinge at exterior doors where specified.
- B. Locksets:
 - 1. All locksets to be Grade 1 heavy duty cylindrical.

a. Product: Subject to compliance with requirements, provide the following:

1) Schlage; ND Series, 17 Lever.

C. Heavy duty surface closers:

1. All closers to be grade 1, cast iron construction.

a. Product: Subject to compliance with requirements, provide the following:

1) LCN; 4040XP Series.

2. Comply with manufacturer's recommendations for unit size based on door size, weather exposure and usage.
3. Provide parallel arms for all overhead closers, except as otherwise indicated.
4. All Closers UL Certified to be in compliance with UBC 7.2 and UL 10C.
5. Closers with pressure relief valves will not be acceptable.
6. Supplier to provide any brackets or plates required for proper
7. Installation of door closers.

D. Exit Devices:

1. Product: Subject to compliance with requirements, provide the following:

a. Von Duprin 99 Series; 996 with 17 lever at interior; 990 pull trim at exterior. Cylinder dogging where indicated.

2. All latchbolts to be deadlatching type.
3. All touchbars to be stainless steel.

E. Special Notes:

1. All doors to have operable hardware.
2. Provide stop that is required for the application. A wall stop is preferred. If an overhead stop or floor stop is a better application, it is to be provided.
3. Smoke seal and intumescent seal is to be provided as required on fire labeled openings.
4. Provide drop plates and mounting brackets for closers if required.

2.3 KEYING

A. All locks shall be keyed to the existing Schlage grand master key system. Keying Schedule must be approved by the Owner prior to ordering any locks. All locks to have Schlage FSIC cylinders, keyed at the direction of the owner.

B. Key all locks separately, or alike, as directed by the Owner's Representative and Architect.

C. Provide keys as follows:

1. Change Keys: Two per lock or as required by Owner's representative.

2. Master Keys: Six required (per system) or as required by Owner's representative.

D. Identification: Stamp all (master-type) keys with the following:

1. "DO NOT DUPLICATE".
2. Key change number (all keys).

2.4 HARDWARE FINISHES

A. Provide matching finishes for hardware units at each door to the greatest extent possible, unless otherwise indicated. In general, match items to the finish for the latch, lock or push pull unit for color and texture.

B. Hardware finishes as follows:

1. 626: Satin chrome-plated.
2. 630: Satin stainless steel .

2.5 HARDWARE PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

| ITEM | SPECIFIED | APPROVED EQUAL |
|-----------------------------------|-----------------------------------|-----------------------|
| Hinges | Ives | Bommer, Stanley |
| Locksets | Schlage | No Substitution |
| Cylinders | Schlage | No Substitution |
| Exit Device | Von Duprin | No Substitution |
| Closers | LCN | No Substitution |
| Flatgoods | Ives | Burns, Trimco |
| Stops | Ives | Burns, Trimco |
| Overhead Stops | Glynn Johnson | Rixson |
| Thresholds | National Guard | Zero, Reese |
| Weatherstrip | National Guard | Zero, Reese |
| Electric Strikes & Power Supplies | Von Duprin/Schlage Electronics | HES/Securitron |

PART 3 - EXECUTION

3.1 PREPARATION

- A. Carefully inspect doors, and conditions under which hardware will be installed. Notify the Architect of any conditions that would adversely affect the installation or subsequent door operation. Do not proceed until unsatisfactory conditions are corrected.
- B. Refer to other Division 08 Sections for installation requirements.
 - 1. Prior to hardware installation, the General Contractor shall setup a meeting with the Hardware Supplier and the Hardware installer to ensure the installer has and understands the manufacturer's installation requirements for all hardware items.
 - 2. The Supplier shall observe the installation of the first lockset, closer, and exit device.

3.2 INSTALLATION

- A. Mount hardware units at heights indicated in respective DHI Standards, except as specifically indicated, or required to comply with governing regulations, and except as may be otherwise directed by the Architect.
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces, which are later to be field, finished, coordinate removal, storage and reinstallation or application of surface protections with finishing work. Do not install surface-mounted items until finishes have been completed on substrate.
- C. Set units level, plumb and true to line and location. Adjust and reinforce the attachments substrate as necessary for proper installation and operation.
- D. Provide fasteners and anchoring devices of suitable size, quantity and type to secure hardware in proper position for heavy use and long life.
 - 1. Drill and countersink unit, which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Adjust door closers immediately upon installation. Adjust in exact conformance with manufacturer's printed instructions. Advance backcheck to eliminate shock at dead stop. Set closer latching speed to assure unassisted positive latching.
 - 1. Degree of swing of door for self-limiting closers shall be maximum available.
- F. Adjust all exit devices immediately upon installation. Adjust in exact conformance with manufacturers' printed instructions.
- G. Install each protection plate with a thin spread of mastic at its center to assure even contact before fastening with screws. Install all such plates on visual center of closed doors. Set bottom edges of all such plates flush with door bottom.

- H. Seal weather protection components attached to the exterior sides of doors and frames, such as drip caps and weather-stripping, in place with clear silicone caulk in such a manner as to ensure a continuously filled seam throughout the joinery.
- I. Cut and fit weather-stripping accurately to provide the greatest possible continuity of the contact element. Adjust closer template as required.

3.3 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units, which cannot be adjusted to operate freely and smoothly as intended for the applications made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.4 INSTRUCTIONS AND INSPECTION

- A. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.
- B. After hardware is installed and adjusted, the Supplier shall inspect the job with the Architect and the Construction Manager to determine if the hardware is functioning properly.
 - 1. Maintain the instruction sheets, layout templates, and any supplementary literature regarding hardware in a readable condition. Transmit all such items to the Owner's Representative, together with all spare parts, specialized tools, other accessories supplied with the hardware, and a copy of the approved hardware schedule at the time of instruction.

3.5 HARDWARE SCHEDULE

HW SET NO. 01

FOR USE ON MARK/DOOR #(S):
 A113B

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|-------------------------|-------------------------------------|--------|-----|
| 2 | EA | CONT. HINGE | 112XY EPT | 628 | IVE |
| 2 | EA | POWER TRANSFER | EPT10 | 689 | VON |
| 1 | EA | REMOVABLE MULLION | KR4954 | 689 | VON |
| 1 | EA | ELEC PANIC HARDWARE | SD-RX-LC-QEL-99-DT | 626 | VON |
| 1 | EA | ELEC PANIC HARDWARE | SD-RX-LC-QEL-99-NL | 626 | VON |
| 1 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 3 | EA | MORTISE CYLINDER | 20-061 | 626 | SCH |
| 1 | EA | OH STOP | 100S | 630 | GLY |
| | | | (SAME LEAF AS OPERATOR) | | |
| 1 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 1 | EA | SURF. AUTO OPERATOR | 4642 WMS | 689 | LCN |
| 1 | EA | PA MOUNTING PLATE | 4040-18PA (IF REQ'D) | 689 | LCN |
| 1 | EA | CUSH SHOE SUPPORT | 4040-30 (IF REQ'D) | 689 | LCN |
| 1 | EA | BLADE STOP SPACER | 4040-61 (IF REQ'D) | 689 | LCN |
| 2 | EA | ACTUATOR, JAMB MOUNT | 8310-818T | 630 | LCN |
| 2 | EA | DOOR SWEEP | 8197AA | AA | ZER |
| 1 | EA | THRESHOLD | 102A | A | ZER |
| 1 | EA | MULLION SEAL | 8780NBK PSA | BK | ZER |
| 2 | EA | DOOR CONTACT | 7764 | 628 | SCE |
| 1 | EA | POWER SUPPLY | PS904 900-2RS 900-4RL | LGR | SCE |
| 1 | EA | NOTE | CARD ACCESS/MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WEATHERSTRIP BY DOOR MANUF | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

DOORS CAN BE DOGGED ELECTRICALLY VIA ACCESS CONTROL SYSTEM ON TIME SCHEDULE, OR MANUALLY BY KEYED CYLINDER ON DEVICE HEAD. WHEN DOORS ARE LOCKED, ENTRY FROM EXTERIOR BY CARD READER, WHICH MOMENTARILY RETRACTS DEVICE LATCHES. INSIDE PUSH PADS ARE FREE EGRESS AT ALL TIMES. DOOR CONTACT MONITORS DOOR POSITION. DOOR TO ALSO BE CAPABLE OF REMOTE RELEASE VIA DESK MOUNT CONSOLE SPECIFIED AT DOOR A105A.

AUTOMATED INGRESS BY PRESSING EXTERIOR ACTUATOR WHEN DOORS ARE DOGGED, OR AFTER VALID CARD READ. AUTOMATED EGRESS BY PRESSING INTERIOR ACTUATOR. WHEN DOOR IS LATCHED, PRESSING INTERIOR ACTUATOR FIRST RETRACTS EXIT DEVICE LATCH, THEN INITIATES AUTO OPERATOR CYCLE.

HW SET NO. 02

FOR USE ON MARK/DOOR #(S):
 A113A

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|------------------------|----------------------------|--------|-----|
| 2 | EA | CONT. HINGE | 112XY EPT | 628 | IVE |
| 2 | EA | POWER TRANSFER | EPT10 | 689 | VON |
| 1 | EA | REMOVABLE MULLION | KR4954 | 689 | VON |
| 2 | EA | ELEC PANIC HARDWARE | SD-RX-LC-QEL-99-DT | 626 | VON |
| 3 | EA | MORTISE CYLINDER | 20-061 | 626 | SCH |
| 2 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 2 | EA | PA MOUNTING PLATE | 4040-18PA (IF REQ'D) | 689 | LCN |
| 2 | EA | CUSH SHOE SUPPORT | 4040-30 (IF REQ'D) | 689 | LCN |
| 2 | EA | BLADE STOP SPACER | 4040-61 (IF REQ'D) | 689 | LCN |
| 2 | EA | DOOR SWEEP | 8197AA | AA | ZER |
| 1 | EA | THRESHOLD | 102A | A | ZER |
| 1 | EA | MULLION SEAL | 8780NBK PSA | BK | ZER |
| 2 | EA | DOOR CONTACT | 7764 | 628 | SCE |
| 1 | EA | POWER SUPPLY | PS904 900-2RS 900-4RL | LGR | SCE |
| 1 | EA | NOTE | MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WEATHERSTRIP BY DOOR MANUF | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

DOORS CAN BE DOGGED ELECTRICALLY VIA ACCESS CONTROL SYSTEM ON TIME SCHEDULE, OR MANUALLY BY KEYED CYLINDER ON DEVICE HEAD. INSIDE PUSH PADS ARE FREE EGRESS AT ALL TIMES. DOOR CONTACT MONITORS DOOR POSITION.

HW SET NO. 03

FOR USE ON MARK/DOOR #(S):
 A150B

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|-------------------------|-------------------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1HW NRP | 630 | IVE |
| 1 | EA | POWER TRANSFER | EPT10 | 689 | VON |
| 1 | EA | ELEC PANIC HARDWARE | SD-RX-LC-QEL-99-NL | 626 | VON |
| 1 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 1 | EA | MORTISE CYLINDER | 20-061 | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 1 | EA | GASKETING | 429A | A | ZER |
| 1 | EA | DOOR SWEEP | 8197AA | AA | ZER |
| 1 | EA | THRESHOLD | 102A | A | ZER |
| 1 | EA | RAIN DRIP | 142A | A | ZER |
| 1 | EA | DOOR POSITION SWITCH | 679-05 | WHT | SCE |
| 1 | EA | POWER SUPPLY | PS902 900-2RS | LGR | SCE |
| 1 | EA | NOTE | CARD ACCESS/MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

DOOR CAN BE DOGGED ELECTRICALLY VIA ACCESS CONTROL SYSTEM ON TIME SCHEDULE, OR MANUALLY BY KEYED CYLINDER ON DEVICE HEAD. WHEN LOCKED, ENTRY VIA EXTERIOR CARD READER, MOMENTARILY RETRACTING DEVICE LATCH. INSIDE PUSH PAD IS FREE EGRESS AT ALL TIMES. DOOR CONTACT MONITORS DOOR POSITION.

HW SET NO. 04

FOR USE ON MARK/DOOR #(S):

A132A B110 C101A

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|------------------------|-------------------------------------|--------|-----|
| 2 | EA | CONT. HINGE | 112XY EPT | 628 | IVE |
| 2 | EA | POWER TRANSFER | EPT10 | 689 | VON |
| 1 | EA | REMOVABLE MULLION | KR4954 | 689 | VON |
| 1 | EA | ELEC PANIC HARDWARE | RX-LC-QEL-99-DT | 626 | VON |
| 1 | EA | ELEC PANIC HARDWARE | RX-LC-QEL-99-NL | 626 | VON |
| 1 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 3 | EA | MORTISE CYLINDER | 20-061 | 626 | SCH |
| 2 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 2 | EA | PA MOUNTING PLATE | 4040-18PA (IF REQ'D) | 689 | LCN |
| 2 | EA | CUSH SHOE SUPPORT | 4040-30 (IF REQ'D) | 689 | LCN |
| 2 | EA | BLADE STOP SPACER | 4040-61 (IF REQ'D) | 689 | LCN |
| 2 | EA | DOOR SWEEP | 8197AA | AA | ZER |
| 1 | EA | THRESHOLD | 102A | A | ZER |
| 1 | EA | MULLION SEAL | 8780NBK PSA | BK | ZER |
| 2 | EA | DOOR CONTACT | 7764 | 628 | SCE |
| 1 | EA | POWER SUPPLY | PS904 900-2RS 900-4RL | LGR | SCE |
| 1 | EA | NOTE | CARD ACCESS/MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WEATHERSTRIP BY DOOR MANUF | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

DOORS CAN BE DOGGED ELECTRICALLY VIA ACCESS CONTROL SYSTEM ON TIME SCHEDULE. WHEN LOCKED, ENTRY VIA EXTERIOR CARD READER, MOMENTARILY RETRACTING DEVICE LATCHES. INSIDE PUSH PADS ARE FREE EGRESS AT ALL TIMES. DOOR CONTACT MONITORS DOOR POSITION.

HW SET NO. 05

FOR USE ON MARK/DOOR #(S):

A139 A139D

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------------|--------------------------|--------|-----|
| 6 | EA | HINGE | 5BB1HW NRP | 630 | IVE |
| 2 | EA | PANIC HARDWARE | WS-9927-EO | 626 | VON |
| 2 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 1 | EA | GASKETING | 328AA-S | AA | ZER |
| 1 | EA | ASTRAGAL (SET) | 8195AA | AA | ZER |
| 2 | EA | DOOR SWEEP | 8197AA | AA | ZER |
| 1 | EA | THRESHOLD | 103A | A | ZER |
| 1 | EA | RAIN DRIP | 142A | A | ZER |
| 2 | EA | DOOR POSITION SWITCH | 679-05 | WHT | SCE |
| 1 | EA | MOTION SENSOR | SCANII | WHT | SCE |
| 1 | EA | NOTE | MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

DOOR CONTACT MONITORS DOOR POSITION.

HW SET NO. 06

FOR USE ON MARK/DOOR #(S):

A155A

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------------|--------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1HW NRP | 630 | IVE |
| 1 | EA | PANIC HARDWARE | LD-99-L-NL-17 | 626 | VON |
| 1 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | GASKETING | 429A | A | ZER |
| 1 | EA | DOOR SWEEP | 8197AA | AA | ZER |
| 1 | EA | THRESHOLD | 102A | A | ZER |
| 1 | EA | RAIN DRIP | 142A | A | ZER |
| 1 | EA | DOOR POSITION SWITCH | 679-05 | WHT | SCE |
| 1 | EA | MOTION SENSOR | SCANII | WHT | SCE |
| 1 | EA | NOTE | MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

DOOR CONTACT MONITORS DOOR POSITION.

NOTE: MOUNT SEAL AT FRAME HEAD FIRST, THEN ATTACH CLOSER PA BRACKET TO SEAL.

HW SET NO. 07

FOR USE ON MARK/DOOR #(S):
A133B

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|-------------------------|--------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1HW NRP | 630 | IVE |
| 1 | EA | PANIC HARDWARE | CD-99-NL | 626 | VON |
| 1 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 1 | EA | MORTISE CYLINDER | 20-061 | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | GASKETING | 429A | A | ZER |
| 1 | EA | DOOR SWEEP | 8197AA | AA | ZER |
| 1 | EA | THRESHOLD | 102A | A | ZER |
| 1 | EA | RAIN DRIP | 142A | A | ZER |
| 1 | EA | DOOR POSITION SWITCH | 679-05 | WHT | SCE |
| 1 | EA | MOTION SENSOR | SCANII | WHT | SCE |
| 1 | EA | NOTE | MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

DOOR CONTACT MONITORS DOOR POSITION.

NOTE: MOUNT SEAL AT FRAME HEAD FIRST, THEN ATTACH CLOSER PA BRACKET TO SEAL.

HW SET NO. 08

FOR USE ON MARK/DOOR #(S):
B205B

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|-------------------|----------------------------|--------|-----|
| 1 | EA | CONT. HINGE | 112XY | 628 | IVE |
| 1 | EA | CLASSROOM LOCK | L9070R 17A | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 1 | EA | PA MOUNTING PLATE | 4040-18PA (IF REQ'D) | 689 | LCN |
| 1 | EA | CUSH SHOE SUPPORT | 4040-30 (IF REQ'D) | 689 | LCN |
| 1 | EA | BLADE STOP SPACER | 4040-61 (IF REQ'D) | 689 | LCN |
| 1 | EA | DOOR SWEEP | 8197AA | AA | ZER |
| 1 | EA | THRESHOLD | 102A | A | ZER |
| 1 | EA | DOOR CONTACT | 7764 | 628 | SCE |
| 1 | EA | MOTION SENSOR | SCANII | WHT | SCE |
| 1 | EA | NOTE | MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WEATHERSTRIP BY DOOR MANUF | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

KEYED SIDE OF LOCKSET TO BE ON INTERIOR OF BUILDING, RESTRICTING ACCESS TO PATIO. LEVER ON PATIO SIDE ALWAYS FREE EGRESS BACK INTO BUILDING. DOOR CONTACT MONITORS DOOR POSITION.

HW SET NO. 09

FOR USE ON MARK/DOOR #(S):
 B205A

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|-------------------|----------------------------|--------|-----|
| 2 | EA | CONT. HINGE | 112XY | 628 | IVE |
| 1 | EA | MULT PT EXIT LOCK | LM9325 17A 626 | 626 | SCH |
| 1 | EA | MULT PT | LM9370R 17A | 626 | SCH |
| | | CLASSROOM | | | |
| 2 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 2 | EA | PA MOUNTING PLATE | 4040-18PA (IF REQ'D) | 689 | LCN |
| 2 | EA | CUSH SHOE SUPPORT | 4040-30 (IF REQ'D) | 689 | LCN |
| 2 | EA | BLADE STOP SPACER | 4040-61 (IF REQ'D) | 689 | LCN |
| 2 | EA | DOOR SWEEP | 8197AA | AA | ZER |
| 1 | EA | THRESHOLD | 102A | A | ZER |
| 2 | EA | DOOR CONTACT | 7764 | 628 | SCE |
| 1 | EA | MOTION SENSOR | SCANII | WHT | SCE |
| 1 | EA | NOTE | MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WEATHERSTRIP BY DOOR MANUF | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

KEYED SIDE OF LOCKSET TO BE ON INTERIOR OF BUILDING, RESTRICTING ACCESS TO PATIO. LEVERS ON PATIO SIDE ALWAYS FREE EGRESS BACK INTO BUILDING. DOOR CONTACTS MONITOR DOOR POSITION.

HW SET NO. 10

A154A

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|-------------------------|--------------------------|--------|-----|
| 6 | EA | HINGE | 5BB1HW NRP | 630 | IVE |
| 2 | EA | MANUAL FLUSH BOLT | FB358/FB458 AS REQ'D | 626 | IVE |
| 1 | EA | DUST PROOF STRIKE | DP1/DP2 AS REQ'D | 626 | IVE |
| 1 | EA | STOREROOM LOCK | ND80RD SPA | 626 | SCH |
| 2 | EA | SURFACE CLOSER | 4040XP SHCUSH | 689 | LCN |
| 2 | EA | KICK PLATE | 8400 10" X 1" LDW B-CS | 630 | IVE |
| 1 | EA | GASKETING | 429A | A | ZER |
| 2 | EA | ASTRAGAL (SET) | 8195AA | AA | ZER |
| 2 | EA | DOOR SWEEP | 8197AA | AA | ZER |
| 1 | EA | THRESHOLD | 102A | A | ZER |
| 1 | EA | RAIN DRIP | 142A | A | ZER |
| 2 | EA | DOOR POSITION SWITCH | 679-05 | WHT | SCE |
| 1 | EA | MOTION SENSOR | SCANII | WHT | SCE |
| 1 | EA | NOTE | MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

DOOR CONTACTS MONITORS DOOR POSITION.

NOTE: MOUNT SEAL AT FRAME HEAD FIRST, THEN ATTACH CLOSER PA BRACKET TO SEAL.

HW SET NO. 11

FOR USE ON MARK/DOOR #(S):
 A113D

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|------------------------|----------------------------|--------|-----|
| 2 | EA | CONT. HINGE | 112XY EPT | 628 | IVE |
| 2 | EA | POWER TRANSFER | EPT10 | 689 | VON |
| 1 | EA | REMOVABLE MULLION | KR4954 | 689 | VON |
| 2 | EA | ELEC PANIC HARDWARE | SD-RX-LC-QEL-99-DT | 626 | VON |
| 3 | EA | MORTISE CYLINDER | 20-061 | 626 | SCH |
| 2 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 2 | EA | PA MOUNTING PLATE | 4040-18PA (IF REQ'D) | 689 | LCN |
| 2 | EA | CUSH SHOE SUPPORT | 4040-30 (IF REQ'D) | 689 | LCN |
| 2 | EA | BLADE STOP SPACER | 4040-61 (IF REQ'D) | 689 | LCN |
| 2 | EA | DOOR SWEEP | 8192AA | AA | ZER |
| 1 | EA | MULLION SEAL | 8780NBK PSA | BK | ZER |
| 2 | EA | DOOR CONTACT | 7764 | 628 | SCE |
| 1 | EA | POWER SUPPLY | PS904 900-2RS 900-4RL | LGR | SCE |
| 1 | EA | NOTE | MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WEATHERSTRIP BY DOOR MANUF | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

DOORS CAN BE DOGGED ELECTRICALLY VIA ACCESS CONTROL SYSTEM ON TIME SCHEDULE, OR MANUALLY BY KEYED CYLINDER ON DEVICE HEAD. INSIDE PUSH PADS ARE FREE EGRESS AT ALL TIMES. DOOR CONTACT MONITORS DOOR POSITION.

HW SET NO. 12

FOR USE ON MARK/DOOR #(S):
 A113C

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|--------------------------|-------------------------------------|--------|-----|
| 2 | EA | CONT. HINGE | 112XY EPT | 628 | IVE |
| 2 | EA | POWER TRANSFER | EPT10 | 689 | VON |
| 1 | EA | REMOVABLE MULLION | KR4954 | 689 | VON |
| 1 | EA | ELEC PANIC HARDWARE | SD-RX-LC-QEL-99-DT | 626 | VON |
| 1 | EA | ELEC PANIC HARDWARE | SD-RX-LC-QEL-99-NL | 626 | VON |
| 1 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 3 | EA | MORTISE CYLINDER | 20-061 | 626 | SCH |
| 1 | EA | OH STOP | 100S | 630 | GLY |
| | | | (SAME LEAF AS OPERATOR) | | |
| 1 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 1 | EA | SURF. AUTO OPERATOR | 4642 WMS | 689 | LCN |
| 1 | EA | PA MOUNTING PLATE | 4040-18PA (IF REQ'D) | 689 | LCN |
| 1 | EA | CUSH SHOE SUPPORT | 4040-30 (IF REQ'D) | 689 | LCN |
| 1 | EA | BLADE STOP SPACER | 4040-61 (IF REQ'D) | 689 | LCN |
| 1 | EA | ACTUATOR, JAMB MOUNT | 8310-818T | 630 | LCN |
| 1 | EA | ACTUATOR, FLUSH MOUNT | 8310-853T X 8310-867F | 630 | LCN |
| 2 | EA | DOOR SWEEP | 8192AA | AA | ZER |
| 1 | EA | MULLION SEAL | 8780NBK PSA | BK | ZER |
| 2 | EA | DOOR CONTACT | 7764 | 628 | SCE |
| 1 | EA | POWER SUPPLY | PS904 900-2RS 900-4RL | LGR | SCE |
| 1 | EA | NOTE | CARD ACCESS/MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WEATHERSTRIP BY DOOR MANUF | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

DOORS CAN BE DOGGED ELECTRICALLY VIA ACCESS CONTROL SYSTEM ON TIME SCHEDULE, OR MANUALLY BY KEYED CYLINDER ON DEVICE HEAD. WHEN DOORS ARE LOCKED, STAFF ENTRY FROM VESTIBULE SIDE BY CARD READER, OR VISITOR ENTRY VIA REMOTE RELEASE BY DESK MOUNT CONSOLE SPECIFIED AT DOOR A105A. INSIDE PUSH PADS ARE FREE EGRESS AT ALL TIMES. DOOR CONTACT MONITORS DOOR POSITION.

AUTO OPERATOR ON RHR LEAF ONLY OPENS DOOR VIA VESTIBULE ACTUATOR WHEN DOOR IS DOGGED, OR AFTER VALID CARD READ. WALL MOUNT ACTUATOR ON PUSH SIDE OPENS DOOR AT ALL TIMES (WHEN LATCHED, PRESSING VESTIBULE ACTUATOR FIRST RETRACTS EXIT DEVICE LATCH, THEN INITIATES AUTO OPERATOR)

HW SET NO. 13

FOR USE ON MARK/DOOR #(S):
 B126

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|-------------------|----------------------------|--------|-----|
| 2 | EA | CONT. HINGE | 112XY | 628 | IVE |
| 2 | EA | DUMMY PUSH BAR | 330-DT-990 | 626 | VON |
| 1 | EA | SURFACE CLOSER | 4040XP EDA | 689 | LCN |
| | | | (RHR LEAF) | | |
| 1 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| | | | (LHR LEAF) | | |
| 2 | EA | PA MOUNTING PLATE | 4040-18PA (IF REQ'D) | 689 | LCN |
| 2 | EA | CUSH SHOE SUPPORT | 4040-30 (IF REQ'D) | 689 | LCN |
| 2 | EA | BLADE STOP SPACER | 4040-61 (IF REQ'D) | 689 | LCN |
| 1 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 2 | EA | DOOR SWEEP | 8192AA | AA | ZER |
| 1 | EA | NOTE | WEATHERSTRIP BY DOOR MANUF | | B/O |

HW SET NO. 14

FOR USE ON MARK/DOOR #(S):
 A132B C101B

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|-------------------|----------------------------|--------|-----|
| 2 | EA | CONT. HINGE | 112XY | 628 | IVE |
| 2 | EA | DUMMY PUSH BAR | 330-DT-990 | 626 | VON |
| 2 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 2 | EA | PA MOUNTING PLATE | 4040-18PA (IF REQ'D) | 689 | LCN |
| 2 | EA | CUSH SHOE SUPPORT | 4040-30 (IF REQ'D) | 689 | LCN |
| 2 | EA | BLADE STOP SPACER | 4040-61 (IF REQ'D) | 689 | LCN |
| 2 | EA | DOOR SWEEP | 8192AA | AA | ZER |
| 1 | EA | NOTE | WEATHERSTRIP BY DOOR MANUF | | B/O |

HW SET NO. 15

FOR USE ON MARK/DOOR #(S):
 A150A

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------------------|-----------------|--------|-----|
| 6 | EA | HINGE | 5BB1HW | 652 | IVE |
| 2 | EA | FEMA FIRE EXIT HARDWARE | WS-9927-L-BE-17 | 626 | VON |
| 2 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 1 | EA | ASTRAGAL (SET) | 8193AA | AA | ZER |
| 1 | EA | GASKETING | 8144S | BK | ZER |

LEAVENWORTH NEW INTERMEDIATE CENTER
LEAVENWORTH, KANSAS

12-18101-00
BID SET

HW SET NO. 16

FOR USE ON MARK/DOOR #(S):

A139A A139B

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------------------|----------------|--------|-----|
| 6 | EA | HINGE | 5BB1HW | 652 | IVE |
| 2 | EA | FEMA FIRE EXIT HARDWARE | WS-9927-L-17 | 626 | VON |
| 2 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 2 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 1 | EA | ASTRAGAL (SET) | 8193AA | AA | ZER |
| 1 | EA | GASKETING | 8144S | BK | ZER |

HW SET NO. 17

FOR USE ON MARK/DOOR #(S):

A155B

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1HW | 652 | IVE |
| 1 | EA | PANIC HARDWARE | 99-L-NL-17 | 626 | VON |
| 1 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP CUSH | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 18

FOR USE ON MARK/DOOR #(S):

A133A

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|---|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1HW | 652 | IVE |
| 1 | EA | PANIC HARDWARE | CDSI-99-L-17 | 626 | VON |
| 1 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 1 | EA | MORTISE CYLINDER | 20-061 | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | GASKETING | 870AA-S | AA | ZER |
| 1 | EA | DOOR BOTTOM | 361AA | AA | ZER |
| 2 | EA | MOUNTING BRACKET (CLOSER AND STRIKE) | 870SPB | | ZER |

HW SET NO. 19

FOR USE ON MARK/DOOR #(S):
A115B

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|------------------------|--------|-----|
| 6 | EA | HINGE | 5BB1HW | 652 | IVE |
| 2 | EA | PANIC HARDWARE | 9927-L-LBR-17 | 626 | VON |
| 2 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 2 | EA | SURFACE CLOSER | 4040XP EDA | 689 | LCN |
| 2 | EA | KICK PLATE | 8400 10" X 1" LDW B-CS | 630 | IVE |
| 2 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 1 | EA | ASTRAGAL (SET) | 8193AA | AA | ZER |
| 1 | EA | GASKETING | 8144S | BK | ZER |

NOTE: PROVIDE SCUSH CLOSER ARM WHERE LEVER TRIM DOES NOT MEET WALL AT 90 OR 180 DEGREES.

HW SET NO. 20

FOR USE ON MARK/DOOR #(S):
A131A A131B

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|------------------------|--------|-----|
| 6 | EA | HINGE | 5BB1HW | 652 | IVE |
| 2 | EA | PANIC HARDWARE | 9927-L-LBR-17 | 626 | VON |
| 2 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 2 | EA | SURFACE CLOSER | 4040XP HEDA | 689 | LCN |
| 2 | EA | KICK PLATE | 8400 10" X 1" LDW B-CS | 630 | IVE |
| 2 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 1 | EA | ASTRAGAL (SET) | 8193AA | AA | ZER |
| 1 | EA | GASKETING | 8144S | BK | ZER |

NOTE: PROVIDE SCUSH CLOSER ARM WHERE LEVER TRIM DOES NOT MEET WALL AT 90 OR 180 DEGREES.

HW SET NO. 21

FOR USE ON MARK/DOOR #(S):

B100 B200

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|--------------------|-------------------------------------|--------|-----|
| 6 | EA | HINGE | 5BB1HW | 652 | IVE |
| 2 | EA | POWER TRANSFER | EPT10 | 689 | VON |
| 2 | EA | PANIC HARDWARE | 9927-L-LBR-E996-17-FSE | 626 | VON |
| 2 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 1 | EA | FIRE/LIFE HOLDER | 4040SEH | 689 | LCN |
| | | | (PULL SIDE MOUNT - LHR LEAF) | | |
| 1 | EA | SURFACE CLOSER | 4040XP CUSH | 689 | LCN |
| | | | (LHR LEAF) | | |
| 1 | EA | SURFACE CLOSER | 4040XP EDA | 689 | LCN |
| | | | (RHR LEAF) | | |
| 2 | EA | KICK PLATE | 8400 10" X 1" LDW B-CS | 630 | IVE |
| 2 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 1 | EA | FIRE/LIFE WALL MAG | SEM7850 | 689 | LCN |
| | | | (RHR LEAF) | | |
| 1 | EA | ASTRAGAL (SET) | 8193AA | AA | ZER |
| 1 | EA | GASKETING | 8144S | BK | ZER |
| 1 | EA | POWER SUPPLY | PS902 900-2RS-FA | LGR | SCE |
| 1 | EA | NOTE | CARD ACCESS/MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

DOORS HELD OPEN ON WALL MAGNET/ELECTRONIC DOOR HOLD-OPEN. WHEN DOORS ARE CLOSED, ENTRY FROM PULL SIDE BY CARD READER, WHICH MOMENTARILY UNLOCKS ELECTRIFIED LEVER TRIM. INSIDE PUSH PADS ARE FREE EGRESS AT ALL TIMES.

HW SET NO. 22

FOR USE ON MARK/DOOR #(S):
 C100A

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|-------------------------------------|--------|-----|
| 6 | EA | HINGE | 5BB1HW | 652 | IVE |
| 2 | EA | POWER TRANSFER | EPT10 | 689 | VON |
| 2 | EA | PANIC HARDWARE | 9927-L-LBR-E996-17-FSE | 626 | VON |
| 2 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP CUSH (LHR LEAF) | 689 | LCN |
| 1 | EA | SURFACE CLOSER | 4040XP EDA (RHR LEAF) | 689 | LCN |
| 2 | EA | KICK PLATE | 8400 10" X 1" LDW B-CS | 630 | IVE |
| 1 | EA | WALL STOP | WS406/407CVX (RHR LEAF) | 630 | IVE |
| 1 | EA | ASTRAGAL (SET) | 8193AA | AA | ZER |
| 1 | EA | GASKETING | 8144S | BK | ZER |
| 1 | EA | POWER SUPPLY | PS902 900-2RS | LGR | SCE |
| 1 | EA | NOTE | CARD ACCESS/MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

DOORS CAN BE LOCKED/UNLOCKED ELECTRICALLY VIA ACCESS CONTROL SYSTEM ON TIME SCHEDULE. WHEN DOORS ARE LOCKED, ENTRY FROM PULL SIDE BY CARD READER, WHICH MOMENTARILY UNLOCKS ELECTRIFIED LEVER TRIM. INSIDE PUSH PADS ARE FREE EGRESS AT ALL TIMES.

HW SET NO. 23

FOR USE ON MARK/DOOR #(S):
A105A

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|------------------------|-------------------------------------|--------|-----|
| 1 | EA | CONT. HINGE | 112XY | 628 | IVE |
| 1 | EA | ENTRANCE LOCK | ND53RD SPA | 626 | SCH |
| 1 | EA | ELECTRIC STRIKE | 6211AL FSE | 630 | VON |
| 1 | EA | SURF. AUTO OPERATOR | 4642 WMS | 689 | LCN |
| 1 | EA | FLOOR STOP | FS439 | 630 | IVE |
| 1 | EA | CONSOLE | 8204 | | SCE |
| 1 | EA | POWER SUPPLY | PS902 900-4RL | LGR | SCE |
| 1 | EA | NOTE | CARD ACCESS/MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WEATHERSTRIP BY DOOR MANUF | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

DOOR EITHER LOCKED OR UNLOCKED ON VESTIBULE SIDE BY KEYED CYLINDER OR THUMBTURN ON OFFICE SIDE. WHEN LOCKSET IS LOCKED FROM VESTIBULE SIDE, STAFF ENTRY VIA CARD READER, OR VISITOR ENTRY BY MOMENTARY SWITCH AT DESK CONSOLE, WHICH MOMENTARILY UNLOCKS ELECTRIC STRIKE. SEPARATE BUTTON AT CONSOLE BOTH RELEASES ELECTRIC STRIKE AND INITIATES AUTO OPERATOR. OFFICE SIDE LEVER ALWAYS FREE EGRESS.

NOTE: DESK CONSOLE IN THIS SET ALSO PROVIDES MOMENTARY REMOTE RELEASE BUTTONS FOR DOORS A113B, A113C, AND A105B.

HW SET NO. 24

FOR USE ON MARK/DOOR #(S):
A105B

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|------------------------|-------------------------------------|--------|-----|
| 1 | EA | CONT. HINGE | 112XY | 628 | IVE |
| 1 | EA | CLASSROOM X STORERM | ND70X80RD SPA XN12-006 | 626 | SCH |
| 1 | EA | ELECTRIC STRIKE | 6211AL FSE | 630 | VON |
| 1 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 1 | EA | PA MOUNTING PLATE | 4040-18PA (IF REQ'D) | 689 | LCN |
| 1 | EA | CUSH SHOE SUPPORT | 4040-30 (IF REQ'D) | 689 | LCN |
| 1 | EA | BLADE STOP SPACER | 4040-61 (IF REQ'D) | 689 | LCN |
| 1 | EA | POWER SUPPLY | PS902 900-4RL | LGR | SCE |
| 1 | EA | NOTE | CARD ACCESS/MONITORING BY OTHERS | | B/O |
| 1 | EA | NOTE | WEATHERSTRIP BY DOOR MANUF | | B/O |
| 1 | EA | NOTE | WIRING DIAGRAM BY OTHERS | | B/O |

OFFICE SIDE LEVER ALWAYS LOCKED. CORRIDOR SIDE LEVER CAN BE LEFT
LOCKED/UNLOCKED BY KEY. REMOTE RELEASE OF ELECTRIC STRIKE FOR ACCESS INTO
SCHOOL IS BY MOMENTARY SWITCH AT DESK CONSOLE SPECIFIED AT DOOR A105A.
CARD READER ON OFFICE SIDE ALLOWS CREDENTIALLED STAFF TO ACCESS CORRIDOR.

NOTE: MOMENTARY REMOTE RELEASE OF ELECTRIC STRIKE IN THIS SET IS BY DESK
CONSOLE SPECIFIED AT DOOR A105A.

HW SET NO. 25

FOR USE ON MARK/DOOR #(S):
A127

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 | 652 | IVE |
| 1 | EA | STOREROOM LOCK | ND80RD SPA | 626 | SCH |
| 1 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 26

FOR USE ON MARK/DOOR #(S):

A101 A203A B116 B119 B216 B219

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 | 652 | IVE |
| 1 | EA | STOREROOM LOCK | ND80RD SPA | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 27

FOR USE ON MARK/DOOR #(S):

A130 A134 A156 A157 A216 B115
 B120 B215 B220

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 | 652 | IVE |
| 1 | EA | STOREROOM LOCK | ND80RD SPA | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP CUSH | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 28

FOR USE ON MARK/DOOR #(S):

A124 A136 A217 B121 B221

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 | 652 | IVE |
| 1 | EA | STOREROOM LOCK | ND80RD SPA | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP HCUSH | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 29

FOR USE ON MARK/DOOR #(S):

A115A A148

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------------|------------------------|--------|-----|
| 6 | EA | HINGE | 5BB1 | 652 | IVE |
| 2 | EA | MANUAL FLUSH BOLT | FB358/FB458 AS REQ'D | 626 | IVE |
| 1 | EA | DUST PROOF STRIKE | DP1/DP2 AS REQ'D | 626 | IVE |
| 1 | EA | STOREROOM LOCK | ND80RD SPA | 626 | SCH |
| 2 | EA | OH STOP | 90S | 630 | GLY |
| 2 | EA | KICK PLATE | 8400 10" X 1" LDW B-CS | 630 | IVE |
| 2 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 30

FOR USE ON MARK/DOOR #(S):

B204

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 | 652 | IVE |
| 1 | EA | CLASSROOM LOCK | ND70RD SPA | 626 | SCH |
| 1 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 31

FOR USE ON MARK/DOOR #(S):

A111 A208 A214B B112 B203 B212
 C100B

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 | 652 | IVE |
| 1 | EA | CLASSROOM LOCK | ND70RD SPA | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP RW/PA | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

NOTE: PROVIDE FLOOR STOP IN LIEU OF WALL STOP WHERE LEVER DOES NOT MEET
 WALL AT 90 OR 180 DEGREES.

HW SET NO. 32

FOR USE ON MARK/DOOR #(S):
A107

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 | 652 | IVE |
| 1 | EA | CLASSROOM LOCK | ND70RD SPA | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP SCUSH | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 33

FOR USE ON MARK/DOOR #(S):
A204A A204B

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 | 652 | IVE |
| 1 | EA | CLASSROOM LOCK | ND70RD SPA | 626 | SCH |
| 1 | EA | OH STOP | 90S | 630 | GLY |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 34

FOR USE ON MARK/DOOR #(S):
B104 B106

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 | 652 | IVE |
| 1 | EA | CLASSROOM LOCK | ND70RD SPA | 626 | SCH |
| 1 | EA | OH STOP | 90S J | 630 | GLY |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 35

FOR USE ON MARK/DOOR #(S):

| | | | | | |
|------|------|------|------|------|------|
| A116 | A117 | A118 | A153 | A204 | A205 |
| A206 | B105 | B108 | B109 | B111 | B113 |
| B114 | B202 | B208 | B210 | B211 | B213 |
| B214 | | | | | |

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|--------------------|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1HW | 652 | IVE |
| 1 | EA | CLASSROOM SECURITY | ND75RD SPA XN12-035 | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP H | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | WALL STOP | WS406/407CCV | 630 | IVE |
| 1 | EA | GASKETING | 8144S | BK | ZER |

HW SET NO. 36

FOR USE ON MARK/DOOR #(S):

| | | |
|------|------|------|
| A207 | B101 | B102 |
|------|------|------|

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|--------------------|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1HW | 652 | IVE |
| 1 | EA | CLASSROOM SECURITY | ND75RD SPA XN12-035 | 626 | SCH |
| 1 | EA | OH STOP | 90S J | 630 | GLY |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | GASKETING | 8144S | BK | ZER |

HW SET NO. 37

FOR USE ON MARK/DOOR #(S):

B201

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|--------------------|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1HW | 652 | IVE |
| 1 | EA | CLASSROOM SECURITY | ND75RD SPA XN12-035 | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP CUSH | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | GASKETING | 8144S | BK | ZER |

HW SET NO. 38

FOR USE ON MARK/DOOR #(S):
A104

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|---------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 | 652 | IVE |
| 1 | EA | ENTRANCE LOCK | ND53RD SPA | 626 | SCH |
| 1 | EA | OH STOP | 90S J | 630 | GLY |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 39

FOR USE ON MARK/DOOR #(S):
A100 A102 A103A A103B A106

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|---------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 | 652 | IVE |
| 1 | EA | ENTRANCE LOCK | ND53RD SPA | 626 | SCH |
| 1 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 40

FOR USE ON MARK/DOOR #(S):
A213

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|---------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 | 652 | IVE |
| 1 | EA | ENTRANCE LOCK | ND53RD SPA | 626 | SCH |
| 1 | EA | OH STOP | 90S | 630 | GLY |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 41

FOR USE ON MARK/DOOR #(S):

A109 A110

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 | 652 | IVE |
| 1 | EA | PRIVACY LOCK | ND40S SPA | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 42

FOR USE ON MARK/DOOR #(S):

B122 B222

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|--------------------|------------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 | 652 | IVE |
| 1 | EA | PRIVACY W/DB & IND | L9496R 17A L583-363 L283-722 | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 43

FOR USE ON MARK/DOOR #(S):

A147 A149

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|-----------------------|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1HW | 652 | IVE |
| 1 | EA | CLASSROOM DEADBOLT | B663R | 626 | SCH |
| 1 | EA | PUSH PLATE | 8200 4" X 16" | 630 | IVE |
| 1 | EA | PULL PLATE | 8305 10" 4" X 16" | 630 | IVE |
| 1 | EA | SURFACE CLOSER | 4040XP RW/PA | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 44

FOR USE ON MARK/DOOR #(S):

A145 A146

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1HW | 652 | IVE |
| 1 | EA | PUSH PLATE | 8200 4" X 16" | 630 | IVE |
| 1 | EA | PULL PLATE | 8305 10" 4" X 16" | 630 | IVE |
| 1 | EA | SURFACE CLOSER | 4040XP RW/PA | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 45

FOR USE ON MARK/DOOR #(S):

A108

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1HW | 652 | IVE |
| 1 | EA | TIME-OUT LOCK | CL3320TO PZD | 626 | C-R |
| 1 | EA | SURFACE CLOSER | 4040XP CUSH | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET NO. 46

FOR USE ON MARK/DOOR #(S):

C100C

ALL HARDWARE BY DOOR MANUFACTURER.

HW SET NO. 47

FOR USE ON MARK/DOOR #(S):

A214A

ALL HARDWARE BY DOOR MANUFACTURER.

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Glass for windows, doors, interior borrowed lites and storefront framing.
 - 2. Glazing sealants and accessories.
- B. Related Requirements:
 - 1. Section 084113 "Aluminum-Framed Entrances and Storefronts."

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.

- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For glass.
- C. Preconstruction adhesion and compatibility test report.
- D. Sample Warranties: For special warranties.

1.7 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.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 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 are below 40 deg F (4.4 deg C).

1.10 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. 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. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: 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 E 1300.
 - 1. Design Wind Pressures: As indicated on Drawings.
 - 2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - 3. Design Snow Loads: Insert design snow load.
 - 4. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.

5. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
 6. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
 7. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 5. 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.
 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

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: "Laminated Glazing Reference Manual" and "Glazing Manual."
 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance

Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Ultraclear Float Glass: ASTM C 1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent and solar heat gain coefficient of not less than 0.87.
- C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) 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.
- D. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) 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.
- E. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B, Type I, Quality-Q3, and complying with other requirements specified.

2.5 MONOLITHIC FLOAT-GLASS UNITS

- A. Uncoated Clear Float-Glass Units (CG): Class 1 (clear) annealed or Kind HS (heat-strengthened) float glass where heat strengthening is required to resist thermal stresses induced by differential shading of individual glass lites and to comply with system performance requirements Kind FT (fully tempered) float glass (CTG).
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advanced Glass Systems Corp.
 - b. AFG Industries Inc.
 - c. Guardian Glass, LLC.
 - d. Insulite Glass Co., Inc.
 - e. Oldcastle Glass Group.
 - f. Pilkington Building Products North America.
 - g. PPG Industries, Inc.
 - h. Viracon.
 - 2. Thickness: 6.0 mm.

2.6 INSULATING-CLEAR GLASS UNITS

A. Solar-Control Low-E Insulating-Clear Glass Units (CIG1, CTIG1):

1. Basis-of-Design Product: Subject to compliance with requirements, provide PPG Industries, Inc.; Ideascapes, Solarban 60 Clear Glass, or a comparable product by one of the following:
 - a. Advanced Glass Systems Corp.
 - b. AFG Industries Inc.
 - c. Guardian Glass, LLC.
 - d. Insulite Glass Co., Inc.
 - e. Oldcastle Glass Group.
 - f. Pilkington Building Products North America.
 - g. Viracon, Inc.
2. Overall Unit Thickness and Thickness of Each Lite: 25 mm and 6.0 mm.
3. Interspace Content: Air.
 - a. Outdoor Lite: Class 1 (clear) float glass.
 - 1) Annealed, Kind HS (heat strengthened) or Kind FT (fully tempered), as required to meet requirements of glazing conditions.
 - b. Indoor Lite: Class 1 (clear) float glass, or as indicated below.
 - 1) Annealed, Kind HS (heat strengthened) or Kind FT (fully tempered), as required to meet requirements of glazing conditions.
 - c. Low-E Coating: Sputtered on second surface.
4. Solar Heat Gain Coefficient: .38.
5. Winter Nighttime U-Factor: 0.29 maximum.
6. Summer Daytime U-Factor: 0.28 maximum.
7. Light to Solar Gain Ratio: 1.84.
8. Vision Light (VLT): 70 percent.

B. Solar-Control Low-E Insulating-Clear Glass Units (CIG2, CTIG2):

1. Basis-of-Design Product: Subject to compliance with requirements, provide PPG Industries, Inc.; Ideascapes, Solarban 70XL Solexia + Clear Glass, or a comparable product by one of the following:
 - a. Advanced Glass Systems Corp.
 - b. AFG Industries Inc.
 - c. Guardian Glass, LLC.
 - d. Insulite Glass Co., Inc.
 - e. Oldcastle Glass Group.
 - f. Pilkington Building Products North America.
 - g. Viracon, Inc.

2. Overall Unit Thickness and Thickness of Each Lite: 25 mm and 6.0 mm.
3. Interspace Content: Air.
 - a. Outdoor Lite: Class 1 (clear) float glass.
 - 1) Annealed, Kind HS (heat strengthened) or Kind FT (fully tempered), as required to meet requirements of glazing conditions.
 - b. Indoor Lite: Class 1 (clear) float glass, or as indicated below.
 - 1) Annealed, Kind HS (heat strengthened) or Kind FT (fully tempered), as required to meet requirements of glazing conditions.
 - c. Low-E Coating: Sputtered on second surface.
4. Solar Heat Gain Coefficient: .27.
5. Winter Nighttime U-Factor: 0.28 maximum.
6. Summer Daytime U-Factor: 0.27 maximum.
7. Light to Solar Gain Ratio: 2.15.
8. Vision Light (VLT): 58 percent.

C. Ceramic-Coated Spandrel Glass (SIG, STIG):

1. Basis-of-Design Product: Subject to compliance with requirements, provide PPG Industries; Ideascapes, Solarban 60 Clear Glass, or a comparable product by one of the following:
 - a. Advanced Glass Systems Corp.
 - b. AFG Industries Inc.
 - c. Guardian Glass, LLC.
 - d. Insulite Glass Co., Inc.
 - e. Oldcastle Glass Group.
 - f. Pilkington Building Products North America.
 - g. Viracon, Inc.
2. Overall Unit Thickness and Thickness of Each Lite: 25 mm and 6.0 mm.
3. Interspace Content: Air.
 - a. Outdoor Lite: Class 1 (clear) float glass.
 - 1) Annealed, Kind HS (heat strengthened) or Kind FT (fully tempered), as required to meet requirements of glazing conditions.
 - b. Indoor Lite: Class 1 (clear) float glass.
 - 1) Annealed, Kind HS (heat strengthened) or Kind FT (fully tempered), as required to meet requirements of glazing conditions.
 - c. Low-E Coating: Sputtered on second surface.
4. Ceramic Coating Color: Manufacturer's standard medium grey color.

- a. Ceramic coating provided on the fourth surface.

2.7 INSULATING-ACID-ETCHED GLASS UNITS

A. Solar-Control Low-E Insulating-Acid-Etched Glass Units (FIG, FTIG):

1. Basis-of-Design Product: Subject to compliance with requirements, provide PPG Industries, Inc.; Ideascapes, Solarban 60 Clear Glass with an acid-etched coating, or a comparable product by one of the following:
 - a. Advanced Glass Systems Corp.
 - b. AFG Industries Inc.
 - c. Guardian Glass, LLC.
 - d. Insulite Glass Co., Inc.
 - e. Oldcastle Glass Group.
 - f. Pilkington Building Products North America.
 - g. Viracon, Inc.
2. Overall Unit Thickness and Thickness of Each Lite: 25 mm and 6.0 mm.
3. Interspace Content: Air.
 - a. Outdoor Lite: Class 1 (clear) float glass.
 - 1) Annealed, Kind HS (heat strengthened) or Kind FT (fully tempered), as required to meet requirements of glazing conditions.
 - b. Indoor Lite: Class 1 (acid-etched on clear) float glass, or as indicated below.
 - 1) Annealed, Kind HS (heat strengthened) or Kind FT (fully tempered), as required to meet requirements of glazing conditions.
 - c. Low-E Coating: Sputtered on second surface.
 - d. Acid-Etched Coating: Basis-of-Design is Guardian Glass, LLC; SatinDeco, 100 percent coverage to be applied on the third surface in a solid pattern.

2.8 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
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. Elastomeric Glazing 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.
1. Single-Component Neutral-Curing Silicone Glazing Sealants:
 - a. Products: Subject to compliance with requirements, provide one of the following or pre-approved equal:
 - 1) Dow Corning Corporation; 790.
 - 2) GE Silicones; SilPruf SCS2000.
 - 3) Pecora Corporation; 864.
 - 4) Polymeric Systems Inc.; PSI-641.
 - 5) Sonneborn, Div. of ChemRex, Inc.; Omniseal.
 - 6) Tremco; Spectrem 3.
 - b. Type and Grade: S (single component) and NS (nonsag).
 - c. Class: 50.
 - d. Use Related to Exposure: NT (nontraffic).
 - e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.

2.9 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 C 1281 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.

2.10 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.

2.11 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 - 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 (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- 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 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. 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 092116.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Gypsum board shaft wall assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each component of gypsum board shaft wall assembly.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For shaft wall assemblies, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.
- C. Low-Emitting Materials: Gypsum shaft wall assemblies shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. Fire-Resistance Rating: As indicated on Code Plans.
- B. 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: 0.033 inch (0.84 mm).
- C. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches (51 mm) long and matching studs in depth.
 - 1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
- D. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.
- E. Elevator Hoistway Entrances: Manufacturer's standard J-profile jamb strut with long-leg length of 3 inches (76 mm), matching studs in depth, and not less than 0.033 inch (0.84 mm) thick.
- F. Room-Side Finish: Gypsum board.
- G. Shaft-Side Finish: Shaft liner board.
- H. Insulation: Sound attenuation blankets.

2.3 PANEL PRODUCTS

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

- B. Gypsum Shaftliner Board, Moisture- and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; ProRoc Moisture and Mold Resistant Shaftliner.
 - b. Georgia-Pacific Gypsum LLC, Subsidiary of Georgia Pacific; Dens-Glass Ultra Shaftliner.
 - c. Lafarge North America, Inc.; Firecheck Type X Shaftliner.
 - d. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner XP.
 - e. PABCO Gypsum; Pabcore Mold Curb Shaftliner Type X.
 - f. Temple-Inland Inc.; Fire-Rated SilentGuard TS Mold-Resistant Gypsum Shaftliner System.
 - g. USG Corporation; Sheetrock Brand Gypsum Liner Panel.
 2. Thickness: 1 inch (25.4 mm).
 3. Long Edges: Double bevel.
- C. Gypsum Board: As specified in Section 092900 "Gypsum Board."

2.4 NON-LOAD-BEARING STEEL FRAMING

- A. Steel Framing Members: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
- B. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.
 - b. Grace Construction Products; FlameSafe FlowTrak System.
 - c. Metal-Lite, Inc.; The System.
 - d. Steel Network Inc. (The); VertiClip SLD Series.

2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with manufacturer's written recommendations.
- B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 092900 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

- D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
 - 1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing according to ASTM E 488 conducted by a qualified testing agency.
 - 2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing according to ASTM E 1190 conducted by a qualified testing agency.
- E. Sound Attenuation Blankets: As specified in Section 092900 "Gypsum Board."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which gypsum board shaft wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 078100 "Applied Fireproofing."
- B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

- A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and ASTM C 754 other than stud-spacing requirements.
- B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

- C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
 - 1. Elevator Hoistway: At elevator hoistway-entrance door frames, provide jamb struts on each side of door frame.
- D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.
- E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.
- F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- G. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.
- H. Cant Panels: At projections into shaft exceeding 4 inches (102 mm), install 1/2- or 5/8-inch (13- or 16-mm-) thick gypsum 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 (610 mm) 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 (610 mm) o.c. and extend studs from the projection to shaft wall framing.
- I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.4 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092116.23

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Non-load-bearing steel framing systems for interior partitions.
- 2. Suspension systems for interior ceilings and soffits.
- 3. Grid suspension systems for gypsum board ceilings.

- 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.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 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 (Z120), hot-dip galvanized unless otherwise indicated.

- B. Studs and Tracks: ASTM C 645.

- 1. Steel Studs and Tracks:

- a. Minimum Base-Metal Thickness: 0.0329 inch (0.836 mm).
- b. Depth: As indicated on Drawings.

2. Dimpled Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 0.015 inch (0.38 mm).
 - b. Depth: As indicated on Drawings.

C. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
2. Depth: As indicated on Drawings.

2.2 SUSPENSION SYSTEMS

A. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; Drywall Grid System.
 - c. USG Corporation; Drywall Suspension System.

2.3 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 one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) 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.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
 - 2. Tile Backing Panels: 16 inches (406 mm) 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 (13-mm) 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. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches (1219 mm) o.c.
 2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
 3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not attach hangers to steel roof deck.
 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Interior gypsum board.
- 2. Tile backing panels.

- B. Related Requirements:

- 1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
- 2. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
- 3. Section 093013 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

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. American Gypsum.
2. CertainTeed Corp.
3. Georgia-Pacific Gypsum LLC.
4. Lafarge North America Inc.
5. National Gypsum Company.
6. PABCO Gypsum.
7. Temple-Inland.
8. USG Corporation.

- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

- C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

- D. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 1.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.

- E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch (15.9 mm), Type X.

2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
 1. Products: Subject to compliance with requirements, provided one of the following:
 - a. CertainTeed Corp.; GlasRoc Tile Backer.
 - b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
 - h. Vertical-Movement Expansion Joint: Fry Reglet Model DRM-50-50, 3-PC.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper.
 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 3. 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, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type 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 compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. 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 (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. 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 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 (1.5 mm) 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. (0.7 sq. m) 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- (6.4- to 9.5-mm-) 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- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: As indicated on Drawings.
 - 2. Type X: As indicated on Drawings.
 - 3. Ceiling Type: As indicated on Drawings.
 - 4. Abuse-Resistant Type: Located at Rooms A108 Seclusion and C100 Commons and at all Corridors to a height of 8 feet above the finished floor.
 - 5. Mold-Resistant Type: At all toilet rooms and lockers rooms.
- 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 horizontally (perpendicular 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.

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 (6.4-mm) gap where panels abut other construction or penetrations.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners unless otherwise indicated.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use where indicated.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile.

3. Level 4: At locations to receive wall covering.

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

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Glazed wall tile.
- 2. Mosaic penny tile.

- B. Related Requirements:

- 1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
- 2. Section 092900 "Gypsum Board" for cementitious backer units.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in 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.

1.4 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 Initial Selection: For tile, grout, and accessories involving color selection.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Full-size units of each type of trim and accessory for each color and finish required.

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:
 1. Installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
 2. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

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 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.

2.2 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 CT1: Glazed wall tile.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Daltile; Multitude (Flat); glazed ceramic wall tile.

- 1) CT1: Nostalgic Blue MU19.
 2. Module Size: 12 by 24 inches.
 3. Thickness: 5/16 inch (8 mm).
 4. Installation Method: Horizontal stacked.
 5. Grout Color: As selected by Architect from manufacturer's full range.
 6. Trim Units:
 - a. External Corners: Provide Schluter®-JOLLY trim profile, satin nickel anodized finish.
 - b. Internal Corners: Field-buttet square corners.
- B. Ceramic Tile Type CT2: Mosaic Penny Tile.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Roca Tile; CC Mosaics.
 - 1) CT2: Cobalt Bright UFCC110-12M.
 2. Module Size: 3/4-inch diameter “penny round” mosaic tile, mesh-mounted on 12-inch by 12-inch sheets.
 3. Thickness: 6mm.
 4. Finish: Gloss.
 5. Grout Color: As selected by Architect from manufacturer's full range.
 6. Trim Units:
 - a. External Corners: Provide Schluter®-JOLLY trim profile, satin nickel anodized finish.

2.4 SETTING MATERIALS

- A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
 1. Mortar for CT1 and CT2:
 - a. Product: Subject to compliance with requirements, provide the following:
 - 1) TEC/H.B. Fuller Construction Products Inc.; Sturdi Flex Thin Set Mortar.
 1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.5 GROUT MATERIALS

- A. High-Performance Tile Grout: ANSI A118.7.

1. Product: Subject to compliance with requirements, provide the following:
 - a. TEC/H.B. Fuller Construction Products Inc.; TEC Power Grout.
2. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.

2.6 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.7 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; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 2. Verify that concrete substrates for tile floors installed with 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 thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. 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 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.
- 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. 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. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Glazed Wall Tile: 1/8 inch.

3.4 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.

3.5 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. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Wall Installations, Metal Studs or Furring:
 1. Ceramic Tile Installation: TCNA W245 or TCNA W248; thinset mortar on glass-mat, water-resistant gypsum backer board.
 - a. Ceramic Tile Type: CT1 and CT2.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: High-performance unsanded grout.
- B. Interior Wall Installations; Masonry or Concrete
 1. Ceramic Tile Installation: TCNA W202; thinset mortar.
 - a. Ceramic Tile Type: CT1 and CT2.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: High-performance unsanded grout.

END OF SECTION 093013

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch- (150-mm-) square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- (300-mm-) long Samples of each type, finish, and color.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 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.

1.6 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.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Provide 100 extra tiles in unopened cartons.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class A according to ASTM E 1264.
 - 2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

- C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 ACOUSTICAL PANELS (APC-1)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc., Ultima 1910, or comparable product by one of the following:
 - 1. CertainTeed Corporation.
 - 2. USG Interiors, Inc.; Subsidiary of USG Corporation.
- B. Color: White.
- C. LR: Not less than 0.90.
- D. NRC: Not less than 0.75.
- E. Edge/Joint Detail: Square.
- F. Thickness: 3/4 inch (19 mm).
- G. Modular Size: 24 by 24 inches (610 by 610 mm).
- H. Antimicrobial Treatment: Broad spectrum fungicide and bactericide based.

2.5 ACOUSTICAL PANELS (APC-2)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc., Ultima 1992, or comparable product by one of the following:
 - 1. CertainTeed Corporation.
 - 2. USG Interiors, Inc.; Subsidiary of USG Corporation.
- B. Color: White.
- C. LR: Not less than 0.90.
- D. NRC: Not less than 0.65.
- E. Edge/Joint Detail: Square.
- F. Thickness: 3/4 inch (19 mm).
- G. Modular Size: 12 by 72 inches (305 by 1830 mm).
- H. Antimicrobial Treatment: Broad spectrum fungicide and bactericide based.

2.6 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
 - 3. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire but provide not less than 0.135-inch- (3.5-mm-) diameter wire.
 - 4. Aircraft Cable: 1/32 inch with crimped connectors.

2.7 METAL SUSPENSION SYSTEM

- A. Basis-of-Design: Subject to compliance with requirements, provide Armstrong World Industries, Inc., 15/16-inch Prelude XL, or comparable product by one of the following:
 - 1. CertainTeed.
 - 2. Chicago Metallic.
 - 3. USG Interiors.
- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; pre-painted, electrolytically zinc coated, or hot-dip galvanized, G30 (Z90) coating designation; with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) type.
 - 3. Face Design: Flat, flush.

4. Cap Material: Cold-rolled steel.
5. Cap Finish: Painted white. To be used with APC-1 and 2.

2.8 METAL EDGE MOLDINGS AND TRIM

- A. Basis-of-Design: Subject to compliance with requirements, provide Armstrong World Industries, Inc. or comparable product by one of the following:
 1. CertainTeed.
 2. Chicago Metallic.
 3. USG Interiors.
- 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 shall 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.
- C. Metal Suspension System Edge Trim for Acoustical Panel Ceiling, Perimeter Trim:
 1. Product: Subject to compliance with requirements, provide Axiom Trim, 4-inch system, or equal.
 - a. Trim: 4-inch high; 9/16-inch face flanges with hems formed for attachment to mounting clip; commercial quality cold-rolled steel factory finished in baked enamel paint finish in color white.
 - b. Splice Plate: Steel in finish to match trim pans; formed for snap-fit into 4-inch pan ends.
 - c. Attachment Clips: Hot-dipped galvanized steel in finish to match pans formed to snap-fit into 4-inch pan and attached to suspension system members.
 - d. 90-Degree Corner Trim Pieces: To match trim
 2. Suspension System Attachment Devices:
 - a. Hanger Wire: Galvanized carbon steel; soft temper; pre-stretched; yield stress load at least three times the design load but not less than 12-gauge.

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

- A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
- 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, counter splaying, 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, post-installed 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 (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) 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 post-installed 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. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends. Miter corners accurately and connect securely.
 2. 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. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 3. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
 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.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch (3 mm in 3.6 m), 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 (3 mm in 3.6 m), non-cumulative.

3.5 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 095436 – SOUND-ABSORBING CEILING BAFFLES

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 sound-absorbing ceiling baffles.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 REFERENCE STANDARDS

- A. ASTM C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2009a.
- B. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- C. ASTM E795, Standard Practices for Mounting Test Specimens During Sound Absorption Tests; 2016.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size.
- C. Samples for Initial Selection: For units with factory-applied finishes.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
- E. Delegated-Design Submittal: For design of attachment devices.

1.6 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. Lighting fixtures.
 - 2. Air outlets and inlets.
 - 3. Speakers.
 - 4. Sprinklers.
- B. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.8 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. Extra Baffles: Quantity equal to 5 percent of total installed, but not less than one of each type (size and color).

1.9 QUALITY ASSURANCE

- A. 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 mockup of typical ceiling area as shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical units from moisture during shipment, storage and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.
- B. Store units flat, in dry, well-ventilated space; do not stand on end.
- C. Protect edges from damage.
- D. Acclimatize product for minimum 24 hours at temperature and humidity approximately that of occupancy prior to 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 attachment devices.
- B. 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 SOUND-ABSORBING CEILING BAFFLES

- A. Manufacturers:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Turf Design; Straight Baffles; contact information is www.turf.design, or comparable product by one of the following:
 - a. Pre-approved equal.
- B. Sound-Absorbing Ceiling Baffles: Prefinished, factory-assembled, sound-absorptive baffles.
 - 1. Acoustical Baffles:
 - a. Noise Reduction Coefficient (NRC): 0.75, per ASTM C423-17.
 - b. Baffle Depth (from top to bottom of baffle): 11 1/2 inches.
 - c. Baffle Thickness: 27mm.
 - d. Baffle Lengths: As indicated on Drawings (refer to Acoustical Baffles Legend on Enlarged Reflected Ceiling Plans).
 - e. Edges: Exposed felt.
 - f. Material: 99 percent recycled polyester felt.
 - g. Color: As selected by Architect from manufacturer's full range of colors (refer to Acoustical Baffles Legend on Enlarged Reflected Ceiling Plans).
 - h. Locations & Layout: As indicated on Drawings.
 - 2. Ceiling-Suspended Accessories: Cable suspension from structure above at locations and in quantities appropriate for weight of each acoustical baffle.
 - a. 1/16-inch steel aircraft cable, provided by installer, in lengths/quantities required.
 - b. Cable Grippers: By manufacturer, embedded in / integral to acoustical baffles.

2.3 FABRICATION

- A. General: Fabricate panels to sizes and configurations indicated.

- B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16-inch for thickness, overall length and width and square-ness from corner to corner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install acoustical baffles in locations indicated, following manufacturer's installation instructions.
- B. Align baffles accurately, with edges plumb and top edges level.
- C. Suspend acoustical baffles at locations and heights indicated.
- D. Install acoustical baffles to construction tolerances of plus or minus 1/16-inch for the following:
 - 1. Plumb and level.
 - 2. Flatness.
 - 3. Width of joints.

3.3 CLEANING

- A. Clean felt facing upon completion of installation from dust and other foreign materials following manufacturer's instructions.
- B. Vacuum occasionally to remove any particulate matter and air-borne debris or dust. Compressed air can be used to dust the material in difficult to reach areas or for large assemblies.

3.4 PROTECTION

- A. Provide protection of installed acoustical panels until completion of the work.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION 095436

SECTION 096466 - WOOD ATHLETIC FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes wood sports-floor assemblies for the Gym.
- B. Related Sections include the following:
 - 1. Section 061053 "Miscellaneous Rough Carpentry" for wood substrates.
 - 2. Section 099300 "Staining and Transparent Finishing" for staining wood flooring.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood sports-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.
 - 2. Layout, colors, widths, and dimensions of game lines and markers.
 - 3. Locations of floor inserts for athletic equipment installed through flooring assembly.
- C. Samples for Initial Selection: Manufacturer's color charts showing colors and glosses available for the following:
 - 1. Game-line and marker paint.
- D. Samples for Verification: For each type of sports-floor assembly and accessory required; approximately 12 inches (300 mm) long and of same thickness and material indicated for the Work.
 - 1. Include sample sets showing the full range of normal color and texture variations expected in wood flooring.
 - 2. Include sample sets showing finishes and game-line paint and marker paint colors applied to wood flooring.
- E. Qualification Data: For Installer.

- F. Maintenance Data: For wood sports-floor assemblies and finish systems to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed wood sports-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 sports-floor assembly components and accessories, and application of game lines and markers.
- B. Maple Flooring: Comply with MFMA grading rules for species, grade, and cut.
 - 1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.

1.5 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.

1.6 PROJECT CONDITIONS

- A. Conditioning period begins not less than seven days before sports-floor assembly installation, is continuous through installation, and continues not less than seven days after sports-floor installation.
 - 1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F (18 and 24 deg C) and relative humidity planned for building occupants, but not less than 35 percent or more than 50 percent, in spaces to receive sports-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 sports-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 sports-floor assemblies after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Robbins, Inc.; Bio-Cushion Panel System or comparable product by one of the following:
1. Aacer Flooring, LLC.
 2. Action Floor Systems, LLC.
 3. Connor Sports Flooring, Inc.
 4. Horner Flooring Company, Inc.
 5. Superior Floor Company, Inc.

2.2 WOOD FLOORING

- A. Strip Flooring: Northern hard maple (*Acer saccharum*), kiln dried, random length, tongue and groove, and end matched.
1. Grade: MFMA-RL Second and Better.
 2. Cut: Flat.
 3. Thickness: 25/32 inch (20 mm).
 4. Face Width: 2-1/4 inches (57 mm).
 5. Backs: Channeled (kerfed) for stress relief.

2.3 SUBFLOOR SYSTEM

- A. Plywood Underlayment: APA rated, C-D Plugged, exterior glue, tongue and groove, 15/32 inch (12 mm) thick.
- B. Resilient Pads: With air voids for resiliency and installed at manufacturer's standard spacing for product designation indicated above.
1. Type: Manufacturer's standard.
 2. Material: Manufacturer's standard.
 3. Thickness: 1/2 inch to 3/4 inch, based on manufacturer's standard.

2.4 ACCESSORIES

- A. Vapor Retarder: ASTM D 4397, polyethylene sheet not less than 6 mils (0.15 mm) thick.
- B. Resilient Wall Base: RB2, refer to 096513 "Resilient Base and Accessories".
- C. Expansion Space Saddle: Surface mounted, mill finished, extruded aluminum type saddlesw for floor-to-floor applications bridging up to 2-inch wide expansion spaces around wood flooring.
1. Blaco, Inc.; Model GF-2P or equal.

- D. Fasteners: Type and size recommended by manufacturer, but not less than those recommended by MFMA for application indicated.
- E. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by sports-floor manufacturer.
- F. Adhesives: Manufacturer's standard for application indicated.
 - 1. Concrete Primers: Manufacturer's standard for application indicated.
 - 2. Use adhesive and primer, if any, that have a VOC content of 60 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- G. Floor-Finish System: System of compatible components recommended in writing by flooring manufacturer and MFMA approved.
 - 1. Type: MFMA Group 5, Water Based Finishes; polyurethane.
 - 2. Floor-Sealer Formulation: Pliable, penetrating type.
 - 3. Finish-Coat Formulation: Formulated for gloss finish and multicoat application.
 - 4. Game-Line and Marker Paint: Industrial enamel compatible with finish coats and recommended in writing by manufacturers of finish coats, and paint for this use.
 - 5. Chemical Components: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Floor Sealers and Finish Coats: VOC content of not more than 350 g/L.
 - b. Game-Line and Marker Paint: VOC content of not more than 150 g/L.

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 sports-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:
 - a. Perform anhydrous calcium chloride test per ASTM F 1869, as follows:
 - 1) Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m) and perform not less than 2 tests in each installation area and with test areas evenly spaced in installation areas.
 - 2) Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.

- b. Perform 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 (3-mm) deviation in any direction when checked with a 10-foot (3-m) 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. General: Comply with sports-floor assembly manufacturer's written instructions, but not less than written recommendations of MFMA applicable to flooring type indicated.
- 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.
- D. Vapor Retarder: Install with joints lapped a minimum of 6 inches (150 mm) and sealed.
- E. Underlayment: Install perpendicular to direction of flooring, staggering end joints in adjacent rows.
- F. Strip Flooring: Mechanically fasten perpendicular to supports.
- G. Installation Tolerances: 1/8 inch in 10 feet (3 mm in 3 m) of variance from level.

3.4 SANDING AND FINISHING

- A. Follow applicable recommendations in MFMA's "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing, and Resurfacing of Maple Gym Floors."
- B. Allow installed flooring to acclimate to ambient conditions for at least 10 days before sanding.

- C. Machine sand with coarse, medium, and fine grades of sandpaper to achieve a level, smooth, uniform surface without ridges or cups. Remove sanding dust by tack or vacuum.
- D. Finish: Apply seal and finish coats of finish system according to finish manufacturer's written instructions. Provide not less than four coats total and not less than two finish coats.
 - 1. Water-Based Finishes: Use finishing methods recommended by finish manufacturer to reduce grain raise and sidebonding effect.
 - 2. Game Lines and Markers: Apply game-line and marker paint between final seal coat and first finish coat according to paint manufacturer's written instructions.
 - a. Mask flooring at game lines and markers and apply paint to produce lines and markers with sharp edges.
 - b. Where game lines cross, break minor game line at intersection; do not overlap lines.
 - c. Apply game lines and markers in widths and colors according to requirements indicated on Drawings.
 - d. Apply finish coats after game-line and marker paint is fully cured.

3.5 PROTECTION

- A. Protect sports 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 sports 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 sports floors. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over sports floors.

END OF SECTION 096466

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient stair accessories.
 - 3. Resilient molding accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches (300 mm) long.
- C. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches (300 mm) long.
- D. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet (3 linear m) for every or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 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 (10 deg C) or more than 90 deg F (32 deg C).

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), 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. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. FloorScore Compliance: Resilient base and stair accessories shall comply with requirements of FloorScore certification.
- B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 THERMOSET RUBBER BASE (RB1)

- A. Manufacturers: Subject to compliance with requirements, provide Johnsonite; BaseWorks™, or comparable product by one of the following:
 - 1. Flexco.
 - 2. Roppe Corporation, USA.
- B. Product Style: Coved.
- C. Locations: As indicated on Drawings.
- D. Thickness: 0.125 inch (3.2 mm).
- E. Height: 4 inches (102 mm).
- F. Lengths: Coils in manufacturer's standard length.
- G. Outside Corners: Job formed.

- H. Inside Corners: Job formed.
- I. Colors: As indicated by manufacturer's designations.
 - 1. Color: RB1: 20 Charcoal.

2.3 VENT COVE WALL BASE (RB2)

- A. Manufacturers: Subject to compliance with requirements, provide Johnsonite; Vent Cove Wall Base, or comparable product by one of the following:
 - 1. Flexco.
 - 2. Roppe Corporation, USA.
- B. Product Style: Coved, with grooved back surface with vertical semi-circular vents.
- C. Locations: As indicated on Drawings.
- D. Height: 4 inches (102 mm).
- E. Lengths: Straight lengths, 48 inches long or in manufacturer's standard lengths.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Color: As selected by Architect from Manufacturer's full range.

2.4 RUBBER STAIR ACCESSORIES (RST)

- 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.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Flexco.
 - 2. Johnsonite; A Tarkett Company.
 - 3. Roppe Corporation, USA
- C. Stair Treads: ASTM F 2169.
 - 1. Type: TP (rubber, thermoplastic).
 - 2. Class: 2 (pattern; embossed, grooved, or ribbed).
 - 3. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
 - 4. Nosing Height: 2 inches (51 mm).
 - 5. Thickness: 1/4 inch (6 mm) and tapered to back edge.

6. Size: Lengths and depths to fit each stair tread in one piece or, for treads exceeding maximum lengths manufactured, in equal-length units.
 7. Integral Risers: Smooth, flat; in height that fully covers substrate.
- D. Landing Tile: Matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
- E. Locations: Provide rubber stair accessories in areas indicated.
- F. Colors and Patterns: As indicated by manufacturer's designations.
1. RST-1:
 - a. Manufacturer: Johnsonite.
 - b. Type: Hammered rubber tread with integrated riser.
 - 1) At Top Steps: Provide companion nosing.
 - c. Colors:
 - 1) RST-1: As selected by Architect from manufacturer's full range.

2.5 RUBBER MOLDING ACCESSORY

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Flexco.
 2. Johnsonite; A Tarkett Company.
 3. Roppe Corporation, USA.
- B. Description: Rubber stair-tread nosing carpet edge for glue-down applications reducer strip for resilient flooring joiner for tile and carpet transition strips.
- C. Profile and Dimensions: As indicated.
- D. Locations: Provide rubber molding accessories in areas indicated.
- E. Colors and Patterns: To be selected by Architect from manufacturer's full range.
1. Description: Edge glue down application from carpet to sealed or polished concrete.
 - a. Product: Roppe Corporation, No. 38.
 2. Description: Reducer strip for resilient floor covering to sealed or polished concrete.
 - a. Product: Roppe Corporation, No. 22.
 3. Description: Joiner for resilient tile flooring and carpet.
 - a. Product: Roppe Corporation, No. 50.

4. Description: Joiner for resilient tile flooring and resinous flooring.
 - a. Product: Roppe Corporation, No. 59.

2.6 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
 1. Adhesives shall have a VOC content of 50 g/L or less except that adhesive for rubber stair treads shall have a VOC content of 60 g/L or less.
 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.
- E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread 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 resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.
- 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 resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

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 practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 6 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 6 inches in length.
 - a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
 - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal 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. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.
 - 1. Apply coat(s) as recommended by manufacturer.

- E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Vinyl composition tile.

- B. Related Sections:

- 1. Section 096513 "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: For each type of resilient floor tile.

- 1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
- 2. Show details of special patterns.

- C. Samples for Initial Selection: For each type of floor tile indicated.

- D. Product Schedule: For floor tile. 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 floor tile 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.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL COMPOSITION TILE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Flooring; Standard Excelon tile or comparable product and color by one of the following:
 - 1. Johnsonite
- B. Tile Standard: ASTM F 1066, Class 2, through pattern, Class 1, solid colors.
- C. Hardness: Manufacturer's standard hardness, measured using Shore, Type A durometer according to ASTM D 2240.
- D. Wearing Surface: Smooth.
- E. Thickness: 0.125 inch (3.2 mm).
- F. Size: 12 by 12 (305 by 305 mm).
- G. Colors: As indicated by manufacturer's designations.
 - 1. VCT-1: 51861 Soft Warm Gray.
 - 2. VCT-2a: 51946 Gentian Blue.
 - 3. VCT-2b: 51934 Lavender Shadow.
 - 4. VCT-2c: 57510 Kickin Kiwi.
 - 5. VCT-2d: 59231 Kumquat Orange.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer for vinyl composition floor tiles.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), 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 F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- E. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

- F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain running in one direction in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile 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 floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096723 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes resinous flooring systems.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Initial Selection: For each type of exposed finish required.
- C. Samples for Verification: For each resinous flooring system required, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.

1.4 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- B. Material Certificates: For each resinous flooring component, from manufacturer.
- C. Material Test Reports: For each resinous flooring system, by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

- 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. Apply full-thickness mockups on 96-inch- (2400-mm-) square floor area selected by Architect.
 - a. Include 96-inch (2400-mm) length of integral cove base with inside and outside corner.
 - 2. Simulate finished lighting conditions for Architect's review of mockups.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.

2.2 RESINOUS FLOORING

- A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Dur-A-Flex; Hybri-Flex EQ Hybrid Flooring System or a comparable product by one of the following:
 - a. Desco Coatings.
 - b. Sherwin-Williams Company, General Polymers.
 - c. Stonhard.
 - d. Tnemec Inc.
- B. System Characteristics:
1. Color and Pattern: As indicated by product designation listed above.
 - a. ERF-1: Custom flake mix as selected by the Architect.
 - b. ERF2: Custom flake mixes as selected by the Architect:
 - 1) ERF2a: Black.
 - 2) ERF2b: White.
 - 3) ERF2c: Blue.
 2. Wearing Surface: Textured for slip resistance.
 3. Overall System Thickness: 1/8 inch (3.2 mm).
 4. Federal Agency Approvals: USDA approved for food-processing environments.
- C. Primer: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.
1. Formulation Description: High solids.
- D. Waterproofing Membrane: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.
1. Formulation Description: High solids.
- E. Reinforcing Membrane: Flexible resin formulation that is recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated and that inhibits substrate cracks from reflecting through resinous flooring.
1. Formulation Description: 100 percent solids.
 - a. Provide fiberglass scrim embedded in reinforcing membrane.
- F. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- G. Body Coats:

1. Resin: Epoxy.
2. Formulation Description: 100 percent solids.
3. Type: Clear.
4. Application Method: Self-leveling slurry with broadcast aggregates.
5. Number of Coats: Two, minimum, and as required to achieve finish specified.
6. Thickness of Coats: 1/16 inch (1.6 mm).
7. Aggregates: Vinyl flakes.

H. Topcoats: Sealing or finish coats.

1. Resin: Epoxy.
2. Formulation Description: High solids.
3. Type: Clear.
4. Number of Coats: Two.
5. Thickness of Coats: 1/16 inch (1.6 mm).
6. Finish: Matte.

I. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 9,200 per ASTM C 579.
2. Tensile Strength: 1,650 per ASTM C 307.
3. Flexural Modulus of Elasticity: 4,000 per ASTM C 580.
4. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch (1.6-mm) permanent indentation per MIL-D-3134.
5. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch (1.6 mm) per MIL-D-3134.
6. Abrasion Resistance: 0.08 maximum weight loss per ASTM D 4060.
7. Flammability: Self-extinguishing per ASTM D 635.
8. Hardness: 85 to 90, Shore D per ASTM D 2240.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 1. Roughen concrete substrates as follows:
 - 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. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
 3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) of slab area in 24 hours.
 - b. Plastic Sheet Test: ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
 - c. Relative Humidity Test: Use in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.
- D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

3.2 APPLICATION

- A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- B. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Waterproofing Membrane: Apply waterproofing membrane over entire substrate surface, in manufacturer's recommended thickness.
1. Apply waterproofing membrane to integral cove base substrates.
- D. Reinforcing Membrane: Apply reinforcing membrane to entire substrate surface.

- E. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
 - 1. Integral Cove Base: 4 inches (100 mm) high.
- F. Self-Leveling Body Coats: Apply self-leveling slurry body coats in thickness indicated for flooring system.
 - 1. Aggregates: Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.
- G. Troweled or Screeded Body Coats: Apply troweled or screeded body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When body coats are cured, remove trowel marks and roughness using method recommended by manufacturer.
- H. Grout Coat: Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat.
- I. Topcoats: Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.

3.3 FIELD QUALITY CONTROL

- A. Material Sampling: Owner may, at any time and any number of times during resinous flooring application, require material samples for testing for compliance with requirements.
 - 1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
 - 3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.
- B. Core Sampling: At the direction of Owner and at locations designated by Owner, take one core sample per 1000 sq. ft. (92.9 sq. m) of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring. Correct deficiencies in installed flooring as indicated by testing.

3.4 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 096723

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes modular carpet tile.
- B. Related Requirements:
 - 1. Section 024119 "Selective Demolition" for removing existing floor coverings.
 - 2. Section 096513 "Resilient Base and Accessories" Section 096519 "Resilient Tile Flooring" for resilient wall base and accessories installed with carpet tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Shop Drawings: For carpet tile installation, plans showing the following:
 - 1. Carpet tile type, color, and dye lot.
 - 2. Type of subfloor.
 - 3. Type of installation.
 - 4. Pattern of installation.
 - 5. Type, color, and location of edge, transition, and other accessory strips.
 - 6. Transition details to other flooring materials.
- C. Samples for Verification: 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- (300-mm-) long Samples.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 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. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."

1.9 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.
 - f. Delamination.
 - 3. Warranty Period: Limited Lifetime of carpet (not less than 10 years) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE – CPT1

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. JJ Flooring Group; Elevated #7074.
 - a. Color:
 - 1) CPT1a: 2064 View
 - 2) CPT1b: 2065 Empire
 - 3) CPT1c: 2069 Terrace
- B. Construction: Textured patterned loop.
- C. Fiber Type: 100% Encore® SD Ultima® Nylon with recycled content.
- D. Dye Method: Solution dyed.
- E. Ounce Weight: 16oz./sy.
- F. Gauge: 1/12.
- G. Total Thickness: 0.25 inches.

- H. Primary Backing: Nexus® modular.
- I. Size: 24 by 24 inches (61 by 61 cm).
- J. Installation Method: Brick.
- K. Performance Characteristics:
 - 1. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D 7330.
 - 2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
 - 3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
 - 4. Tuft Bind: Not less than 8 lbf (36 N) according to ASTM D 1335.
 - 5. Delamination: Not less than 3.5 lbf/in. (0.6 N/mm) according to ASTM D 3936.
 - 6. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
 - 7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
 - 8. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
 - 9. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
 - 10. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.2 CARPET TILE – CPT2

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Tandus-Centiva; Geoknit #10887.
 - a. Color:
 - 1) CPT2: 42714 Woven Cane.
- B. Construction: Stratatec® patterned loop.
- C. Fiber Type: TDX® Nylon.
- D. Dye Method: Solution dyed.
- E. Face Weight: 23 oz./sy.
- F. Gauge: 5/64.
- G. Pile Height Average: .187 inch.
- H. Primary Backing: Non-woven synthetic fiber.
- I. Size: 24 by 24 inches (61 by 61 cm).
- J. Installation Method: Monolithic.
- K. Performance Characteristics:

1. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D 7330.
2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
4. Tuft Bind: Not less than 8 lbf (36 N) according to ASTM D 1335.
5. Delamination: Not less than 3.5 lbf/in. (0.6 N/mm) according to ASTM D 3936.
6. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
8. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
9. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
10. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.3 CARPET TILE – CPT3

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Interface; Cloud Cover.
 - a. Color:
 - 1) CPT3: 105715 Dark Sky.

B. Construction: Tufted cut & loop.

C. Fiber Type: 100% recycled content Type 6 nylon/

D. Dye Method: Solution dyed.

E. Pile Density: 7,747

F. Pile Thickness: 0.079 inches.

G. Primary Backing: GlasBac® Tile.

H. Size: 50cm by 50cm.

I. Installation Method: Non-directional.

J. Performance Characteristics:

1. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D 7330.
2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
4. Tuft Bind: Not less than 8 lbf (36 N) according to ASTM D 1335.
5. Delamination: Not less than 3.5 lbf/in. (0.6 N/mm) according to ASTM D 3936.
6. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).

8. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
9. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
10. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.4 CARPET TILE – WOC

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Bentley; Rough Idea.
 - a. Color:
 - 1) WOC: Draft 800655.
- B. Construction: Tufted textured loop.
- C. Fiber Type: Ultron® Nylon 6,6.
- D. Dye Method: Solution dyed.
- E. Yarn Weight: 26oz./sy.
- F. Gauge: 5.64 in.
- G. Total Thickness: 0.27 inches.
- H. Primary Backing: AFIRMA™ Hardback.
- I. Size: 24 by 24 inches (61 by 61 cm).
- J. Installation Method: Monolithic.
- K. Performance Characteristics:
 1. Appearance Retention Rating: Heavy traffic, 4.0 minimum according to ASTM D 7330.
 2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
 3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
 4. Tuft Bind: Not less than 8 lbf (36 N) according to ASTM D 1335.
 5. Delamination: Not less than 3.5 lbf/in. (0.6 N/mm) according to ASTM D 3936.
 6. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
 7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
 8. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
 9. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
 10. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.5 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 comply with flammability requirements for installed carpet tile, and are 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.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m) 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 F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb. of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 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.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- 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 (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

- C. Concrete Substrates: 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 adhesive and carpet tile manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive Free lay; install carpet tiles without adhesive.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns indicated.
- E. 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.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. 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 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's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 097200 - WALL COVERINGS

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. Type II vinyl wallcovering.
 - 2. Custom graphic vinyl wallcovering.
- B. Related Sections:
 - 1. Section 099123 "Interior Painting" for priming wall surfaces.

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 pattern placement, 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-inch- (914-mm-) long in size.
 - 1. Wall-Covering Sample: From same production run to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.
- D. Product Schedule: For wall coverings. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. 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 product 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 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 temporary 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.
- B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.
- C. 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 according to 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 E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 50 or less.
 - 2. Fire-Growth Contribution: No flashover and heat and smoke release according to NFPA 265.

2.2 TYPE II VINYL WALLCOVERING (WC1)

- A. Product: Subject to compliance with requirements, provide the following:

1. Manufacturer: MDC; Meridian.

a. Color:

- 1) WC1a: MMD1911 Sapphire.
- 2) WC1b: MMD1915 Phantom.
- 3) WC1c: MMD1908 Tropic.

B. Description: Provide mildew-resistant products in rolls from same production run and complying with the following:

1. FS CCC-W-408D and CFFA-W-101-D for Type II, Medium-Duty products.

C. Content: Fabric-backed vinyl.

D. Width: 54 inches (1372 mm).

E. Weight: 20 oz. per linear yard.

F. Backing: Osnaburg.

G. Pattern Match: Random reversible.

2.3 CUSTOM GRAPHIC VINYL WALL COVERING (WC2, WC3)

A. Product: Subject to compliance with requirements, provide the following:

1. Manufacturer: MDC Studio Design Solutions; Digital Dreamscape; Custom Graphic.

- a. WC2: Contractor's bid must include costs for manufacturer creative services team providing design assistance for development of original graphics.
- b. WC3: Contractor's bid must include all costs for providing material for Architect's reviews of custom design and colors (strike-offs, samples, etc).

2. Type II Vinyl Wallcovering: Dreamscape Smooth Matte.

B. Description: Provide mildew-resistant products in rolls from same production run and complying with the following:

1. FS CCC-W-408D and CFFA-W-101-D for Type II, Medium-Duty products.

C. Width: 60 inches (1372 mm).

D. Weight: 20 oz. per linear yard.

E. Backing: Osnaburg.

2.4 ACCESSORIES

- A. Adhesive: Mildew-resistant, non-staining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.
- B. Primer/Sealer: Mildew resistant, complying with requirements in Section 099123 "Interior Painting" and recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, 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, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 2. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semi-gloss, and eggshell finish with fine sandpaper.
- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 WALL-COVERING INSTALLATION

- A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.

- B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.
- C. Install strips in same order as cut from roll.
- D. Install wall covering without lifted or curling edges and without visible shrinkage.
- E. Install seams vertical and plumb at least 6 inches (150 mm) from outside corners and 6 inches (150 mm) from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.
- F. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.
- G. 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 098415 – CEMENTITIOUS WOOD FIBER WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Cementitious wood fiber acoustical wall panel and ceiling panel systems and installation accessories.
- B. Related Sections:
 - 1. Section 099123 “Interior Painting” for field-painting wall panels.

1.3 REFERENCES

- A. ASTM International:
 - 1. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. Provide acoustical wall and ceiling panel assembly designed and tested to provide surface burning characteristics (ASTM E84) as follows:
 - a. Flamespread: 5.
 - b. Smoke Developed: 15.
 - 2. Provide acoustical wall and ceiling panel system which has been manufactured, fabricated and installed to provide Noise Reduction Coefficient (NRC) rating as follows:
 - a. NRC Rating: 1.05.

1.5 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Section 011300 “Submittal Procedures.”

- B. Product Data: Submit manufacturer's product data and installation instructions.
 - 1. Recommended procedures for normal cleaning and removal of stains including precautions in use of cleaning materials that may be detrimental to surfaces.
- C. Quality Assurance/Control Submittals: Submit the following:
 - 1. Test Reports: Upon request, submit certified test reports from recognized test laboratories.
 - 2. Certificates: Submit manufacturer's certificate that products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity.
- B. Regulatory Requirements and Approvals: Comply with requirements below.
 - 1. International Conference of Building Officials (ICBO):
 - a. ICBO Research Report No. 1116.
 - 2. Underwriters' Laboratories of Canada (ULC) label.
 - a. Structural Cement-Fiber Unit-535X.

1.7 DELIVERY, STORAGE AND HANDLING

- A. General: Comply with Section 016000 "Product Requirements."
- B. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
 - 1. Prevent soiling, physical damage or wetting.
 - 2. Store cartons open at each end to stabilize moisture content and temperature.

1.8 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Do not install acoustical panels until building is closed in and HVAC system is operational.
 - 2. Locate materials onsite at least 24 hours before beginning installation to allow materials to reach temperature and moisture content equilibrium.
 - 3. Maintain the following conditions in areas where acoustical materials are to be installed 24 hours before, during and after installation:
 - a. Relative Humidity: 65% to 75%.

- b. Uniform Temperature: 55 to 70 degrees F (13 to 21 degrees C).

1.9 MAINTENANCE

- A. Extra Materials: Provide two additional panels for use by Owner in building maintenance and repair.

PART 2 - PRODUCTS

2.1 ACOUSTICAL WALL PANEL SYSTEM (AWP2)

- A. Manufacturer: Tectum by Armstrong World Industries.
- B. Proprietary Systems: Acoustical wall panel systems, including the following:
 - 1. Tectum Finale Wall Panels (AWP2):
 - a. Material: Aspen wood fibers bonded with inorganic hydraulic cement.
 - b. Thickness: 1-1/2-inch baseboard plus 2 inches Tectum furring with SoniCor fiber core between the furring.
 - c. Edge: Bevel all edges.
 - d. Width: As indicated.
 - e. Length: As indicated.
 - f. Color: Field painted per Section 099123 "Interior Painting." Paint as indicated on Drawings.
 - g. Mounting Style: "A" screw attached to suitable substrate.
 - h. Factory-applied white primer.

2.2 ACOUSTICAL CEILING PANEL SYSTEM (TCP1)

- A. Manufacturer: Tectum by Armstrong World Industries.
- B. Proprietary Systems: Acoustical ceiling panel systems, including the following:
 - 1. TECTUM Clouds (TCP1):
 - a. Material: Aspen wood fibers bonded with inorganic hydraulic cement.
 - b. Size: 23 3/4-inches wide by 48 inches long by 1 1/2-inches thick.
 - c. Edge: Square all edges.
 - d. Color: Field painted per Section 099123 "Interior Painting." Paint color shall be Sherwin Williams 7064 Passive.
 - e. Mounting Style: Metal suspension system suspended from structure above.
 - f. Factory-applied white primer.
 - g. NRC: .50.

2.3 ACCESSORIES

- A. Provide accessories as follows:
 - 1. Tectum Painted Head Drywall Screws:
 - a. Material: Steel.

2.4 METAL SUSPENSION SYSTEM

- A. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, direct hung unless otherwise indicated.
- B. Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft annealed, with a yield stress load of at least three times design load, but not less than 12 gauge.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Comply with the instructions and recommendations of the acoustical wall panel system manufacturer.
- B. Install materials in accordance with governing regulations, fire resistance rating requirements and industry standards applicable to work.
 - 1. Comply with CISCA Code of Practices.

3.2 EXAMINATION

- A. Site Verification of Conditions:
 - 1. Examine surfaces scheduled to receive suspended or directly attached acoustical units for unevenness, irregularities and dampness that would affect quality and execution of work.
 - 2. Do not proceed with installation of wall panel system until unacceptable conditions are corrected.

3.3 INSTALLATION

- A. Install panels in accordance to manufacturer's installation instructions. Follow the requirements of the International Building Code, ASCE 7 and ASTM E580 and in install in accordance with the authorities having jurisdiction.
- B. Screw head to be flush with panel surface.
- C. Cover field cut edges.

- D. Paint as indicated on the Drawings.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel, trim, moldings and suspension members to comply with manufacturer's instructions for cleaning.
- B. Touch up any minor finish damage.
- C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 PROTECTION

- A. Protect installed work from damage due to subsequent construction activity, including temperature and humidity limitations and dust control, so that the work will be without damage and deterioration at the time of acceptance by the Owner.

END OF SECTION 098415

SECTION 098433 – SOUND-ABSORBING WALL UNITS

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 shop-fabricated fabric wrapped wall panels with acoustical properties.
- B. Related Sections include the following:
 - 1. Section 097723 “Fabric-Wrapped Panels” for shop-fabricated, tackable fabric-wrapped non-acoustical wall panels.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for acoustical wall panels, including plans, elevations, sections, details, and attachments to other Work.
 - 1. Show orientation of fabric application, pattern matching, and seams.
- C. Samples for Verification: 8-by-11-inch (200-by-280-mm) units of each type of acoustical wall panel indicated; in sets for each color, texture, and pattern specified for facing materials, showing the full range of variations expected in these characteristics. Include samples of installation devices and accessories.
- D. Maintenance Data: For acoustical wall panels and facings to include in maintenance manuals specified in Division 01.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing acoustical wall panels similar to those indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations for Acoustical Wall Panels: Obtain acoustical wall panels from one source with resources to provide products of consistent quality in appearance and physical properties.
- C. Fire-Test-Response Characteristics: Provide acoustical wall panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or

another testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical wall panels with appropriate markings of applicable testing and inspecting agency.

1. Flame Spread: 25 or less.
2. Smoke Developed: 450 or less.

- D. Acoustical wall panel to meet NRC as established by ASTM C423 with Type A mounting test method.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical wall panels from excessive moisture when shipping, storing, and handling. Deliver in unopened bundles and store in a dry place with adequate air circulation. Do not deliver material to building until wet-work, such as concrete and plaster, has been completed and cured to a condition of equilibrium. Protect panel edges from crushing and impact.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical wall panels until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Air-Quality Limitations: Protect acoustical wall panels from exposure to airborne odors, such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.
- C. Field Measurements: Verify wall surface dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish surface dimensions and proceed with fabricating acoustical wall panels without field measurements. Coordinate wall construction to ensure that actual surface dimensions correspond to established dimensions.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fabric-wrapped wall panels that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Fabric sagging, distorting, or releasing from panel edge.
 - b. Warping of core.
 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACOUSTICAL WALL PANELS, GENERAL

- A. Fabricate panels to sizes and configurations indicated; attach facing materials to cores to produce installed panels with visible surfaces fully covered and free from waves in fabric weave, wrinkles, sags, blisters, seams, adhesive, or other foreign matter.
 - 1. Fabricate back-mounted panels in factory to exact sizes required to fit wall surfaces, based on field measurements of completed substrates indicated to receive acoustical wall panels.
 - 2. Where square corners are indicated, tailor corners.
 - 3. Where fabric facings with seams are indicated, fabricate invisible seams and comply with Shop Drawings for location.
- B. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch (1.6 mm) for the following:
 - 1. Thickness.
 - 2. Edge straightness.
 - 3. Overall length and width.
 - 4. Squareness from corner to corner.
 - 5. Chords, radii, and diameters.
- C. Sound-Absorption Performance: Provide acoustical wall panels with minimum noise reduction coefficients indicated, as determined by testing per ASTM C 423 for mounting type specified under individual product requirements in the Acoustical Wall Panel Schedule at the end of Part 3.
- D. Back-Mounting Accessories: Manufacturer's standard or recommended accessories for securely mounting panels, of type and size indicated, to substrates provided; and complying with the following requirements:
 - 1. Mechanically Mounted Edge-Reinforced Panels: Metal panel-clip and base-support bracket system consisting of two-part panel clips, with one part of each clip mechanically attached to back of panel and the other part to wall substrate, designed to support panels laterally; and base-support brackets designed to support full weight of panels; with both designed to allow for panel removal.

2.2 FABRIC-WRAPPED WALL PANELS (AWP1)

- A. Back-Mounted, Edge-Reinforced Acoustical Wall Panels: Manufacturer's standard panel construction consisting of facing material laminated to front face, edges, and back border of dimensionally stable, rigid glass-fiber board core; with edges chemically hardened or impact resistant and resilient to reinforce panel perimeter against warpage and damage; and complying with the following requirements:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Conwed; Designscape; an Owens-Corning Company.
 - b. Decoustics Limited; a CertainTeed Ceilings Company.
 - c. Golterman & Sabo.
 - d. Kinetics.
2. Facing Material:
- a. Manufacturers/Colors: Provide the following:
 - 1) Manufacturer: Carnegie.
 - a) Style: Scott.
 - b) Pattern No.: 5074.
 - c) AWP-1: 211.
3. Nominal Core Density: 4 to 7 lb/cu. ft. (64 to 112 kg/cu. m)
 4. Nominal Overall Panel Thickness and Noise Reduction Coefficient: 1-1/2 inches (38 mm) and not less than NRC 0.95.
 5. Panel Width: As indicated on the Drawings.
 6. Panel Height: As indicated on the Drawings. Panels are to be installed on the wall as indicated on the Drawings.
 7. Edge Detail: Square.
 8. Corner Detail: Square.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and blocking, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting acoustical wall panel performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install acoustical wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, and scribed to fit adjoining work accurately at borders and at penetrations. Comply with panel manufacturer's written instructions for installation of panels using type of mounting accessories indicated or, if not indicated, as recommended by manufacturer.
- B. Construction Tolerances: As follows:
 1. Variation from Plumb and Level: Plus or minus 1/16 inch (1.6 mm).
 2. Variation of Joints from Hairline: Not more than 1/16 inch (1.6 mm).

3.3 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.

- B. Clean panels with fabric facing, on completion of installation, to remove dust and other foreign materials according to manufacturer's written instructions.
- C. Remove surplus materials, rubbish, and debris resulting from acoustical wall panel installation, on completion of the Work, and leave areas of installation in a neat and clean condition.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure acoustical wall panels are without damage or deterioration at time of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 098433

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on exterior substrates.
- B. Related Requirements:
 - 1. Section 099123 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.
 - 2. Section 099600 "High-Performance Coatings" for special-use coatings.

1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.

2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

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 (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

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. Diamond Vogel Paints.
3. ICI Paints.
4. Kwal Paint.
5. PPG Architectural Finishes, Inc.
6. Pratt & Lambert.
7. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

C. Colors: As indicated in a Section 099123 "Interior Painting."

2.3 METAL PRIMERS

A. Primer, Alkyd, Anti-Corrosive for Metal:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin Williams; ProCryl Universal Primer, or equal product by one of the manufacturers indicated.

2.4 WATER-BASED PAINTS

A. Light Industrial Coating, Exterior, Water Based (Gloss Level 3):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin Williams; Sher-Cryl HPA Semi-Gloss, or equal product by one of the manufacturers indicated.

2.5 SOLVENT-BASED PAINTS

A. Alkyd, Exterior, Semi-Gloss (Gloss Level 5): MPI #94.

2.6 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from

previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

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. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- 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 re-prime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 3, "Power Tool Cleaning."
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 4. Paint entire exposed surface of window frames and sashes.
 - 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. 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.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. Galvanized-Metal Substrates:

1. Water-Based Light Industrial Coating System:
 - a. Prime Coat: Primer, acrylic, anti-corrosive.
 - b. Intermediate Coat: Light industrial coating.
 - c. Topcoat: Light industrial coating.
 - d. Colors: To be selected by Architect to match existing.
 2. Locations: At all exterior hollow metal doors and frames and other exterior miscellaneous metals to be painted as indicated on the Drawings.
- B. Steel Substrates:
1. Alkyd System:
 - a. Prime Coat: Primer, alkyd, anticorrosive for metal.
 - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - c. Topcoat: Alkyd, exterior, semi-gloss (Gloss Level 5).
 - d. Colors: To be selected by Architect to match existing.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Concrete masonry units (CMU).
 - 3. Steel.
 - 4. Galvanized metal.
 - 5. Gypsum board.
 - 6. Wood.
- B. Related Sections include the following:
 - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 06 Sections for shop priming carpentry with primers specified in this Section.
 - 3. Division 08 Sections for factory priming windows and doors with primers specified in this Section.
 - 4. Section 099113 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
 - 5. Section 099600 "High Performance Coatings" for surface preparation and the application of paint systems on exterior substrates.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Manufacturer's Written Instructions: Submit manufacturer's written instructions for the application of the floor sealer identifying the process of installing and finishing the specific product specified.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.

4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Benjamin Moore & Co.
 2. Columbia Paint & Coatings.
 3. Diamond Vogel.
 4. Glidden Professional.
 5. ICI Paints.
 6. Iowa Paint Manufacturing Company, Inc.
 7. Kwal-Howells Paint.
 8. PPG Architectural Finishes, Inc.
 9. Pratt & Lambert.
 10. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
 2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
 3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 4. Floor Coatings: VOC not more than 100 g/L.
 5. Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
 6. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
 7. Dry-Fog Coatings: VOC content of not more than 400 g/L.
 8. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
 9. Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.
- C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1,2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.
 - p. Isophorone.
 - q. Lead.
 - r. Mercury.
 - s. Methyl ethyl ketone.
 - t. Methyl isobutyl ketone.
 - u. Methylene chloride.
 - v. Naphthalene.
 - w. Toluene (methylbenzene).
 - x. 1,1,1-trichloroethane.
 - y. Vinyl chloride.

D. Colors: See Paint Color Schedule at the end of this Section.

2.3 BLOCK FILLERS

A. Interior/Exterior Latex Block Filler: MPI #4.

1. VOC Content: E Range of E2.

2.4 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 1.

2.5 METAL PRIMERS

- A. Quick-Drying Alkyd Metal Primer: MPI #76.
 - 1. VOC Content: E Range of E2.
- B. Waterborne Galvanized-Metal Primer: MPI #134.
 - 1. VOC Content: E Range of E2.
 - 2. Environmental Performance Rating: EPR 2.

2.6 LATEX PAINTS

- A. Interior Latex (Low Sheen): MPI #44 (Gloss Level 2).
 - 1. VOC Content: E Range of E2.
 - 2. Environmental Performance Rating: EPR 2.
- B. Interior Latex (Satin): MPI #43 (Gloss Level 4).
 - 1. VOC Content: E Range of E2.
 - 2. Environmental Performance Rating: EPR 2.
- C. Interior Latex (Semigloss): MPI #54 (Gloss Level 5).
 - 1. VOC Content: E Range of E2.
 - 2. Environmental Performance Rating: EPR 3.

2.7 ALKYD PAINTS

- A. Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).
 - 1. VOC Content: E Range of E2.
 - 2. Environmental Performance Rating: EPR 2.

2.8 DRY FALL/FOG COATINGS

- A. Dry fall, latex, flat, MPI #118.
 - 1. VOC Content: E Range of E2.
 - 2. Environmental Performance Rating: EPR 2.

2.9 FLOOR COATINGS

- A. Interior Clear Concrete Floor Sealer (Water Based):
 - 1. VOC Content: E Range of E2.

2. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. CureCrete Chemical Co., Inc.; Ashford Formula.
 - b. Euclid Chemical Co., Inc.; Diamond Hard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.
 2. Masonry (Clay and CMU): 12 percent.
 3. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Concrete Masonry Substrates: Remove 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.
- F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- H. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 APPLICATION

- A. Apply floor sealers according to manufacturer's written instructions.
- B. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Apply block fillers to achieve a pinhole free surface.
 - 3. 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.
 - 4. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- C. 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.
- D. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- E. 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.
- F. Painting Mechanical and Electrical Work: Paint items exposed and as indicated on the Drawings including, but not limited to, the following:
 - 1. Mechanical Work:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.

- c. Pipe hangers and supports.
- d. Tanks that do not have factory-applied final finishes.
- e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
- f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
- g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:

- a. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

- 1. Latex System: MPI INT 3.1E.
 - a. Prime Coat: Interior latex matching topcoat.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (satin).

B. Concrete Substrates, Traffic Surfaces:

- 1. Water-Based Clear Sealer System: MPI INT 3.2G.
 - a. First Coat: Interior/exterior clear concrete floor sealer (water based).
 - b. Topcoat: Interior/exterior clear concrete floor sealer (water based).

C. CMU Substrates:

- 1. Latex System: MPI INT 4.2A.

- a. Prime Coat: Interior/exterior latex block filler.
- b. Intermediate Coat: Interior latex matching topcoat.
- c. Topcoat: Interior latex (satin).

D. Steel Substrates:

1. Alkyd System: MPI INT 5.1E.

- a. Prime Coat: Quick-drying alkyd metal primer.
- b. Intermediate Coat: Interior alkyd matching topcoat.
- c. Topcoat: Interior alkyd (semigloss).

E. Galvanized-Metal Substrates: Including exposed structure and related items:

1. Water-Based Dry-Fall System: MPI INT 5.3H.

- a. Prime Coat: Waterborne dry fall.
- b. Topcoat: Waterborne dry fall.

F. Gypsum Board Substrates:

1. Latex System: MPI INT 9.2A.

- a. Prime Coat: Interior latex primer/sealer and matching topcoat.
- b. Intermediate Coat: Interior latex matching topcoat.
- c. Topcoat: Interior latex.
 - 1) Ceiling and Soffits: Low sheen.
 - 2) Walls: Satin.

G. Wood and Cementitious Wood Fiber Panels (Primed):

1. Latex System: MPI INT 10.1A.

- a. Intermediate Coat: Interior latex matching topcoat.
- b. Topcoat: Interior latex (flat, low sheen).

3.6 PAINT COLOR SCHEDULE

A. Paint Color (P-X): Provide the following:

1. Manufacturer: Sherwin Williams.
 - a. P-1: SW7103 Whitetail.
 - b. P-2: SW7064 Passive.
 - c. P-3: SW7643 Pussywillow.
 - d. P-4: SW7068 Grizzle Gray.
 - e. P-5: Custom match Pantone 293.
 - f. P-6: SW6966 Blueblood.
 - g. P-7: SW6801 Regale Blue.
 - h. P-8: SW6799 Soar.

- i. P-9: SW6545 Majestic Purple.
- j. P-10: SW6541 Daydream.
- k. P-11: SW6719 Gecko.
- l. P-12: SW6708 Springtime.
- m. P-13: SW6650 Marquis Orange.
- n. P-14: SW6364 Eggwhite.
- o. P-15: SW6258 Tricorn Black.

END OF SECTION 099123

SECTION 099600 - HIGH-PERFORMANCE COATINGS

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 surface preparation and application of high-performance coating systems on the following substrates:
 - 1. Interior Substrates:
 - a. Concrete masonry units (CMU).
 - b. Gypsum board.
- B. Related Requirements:
 - 1. Division 09 painting Sections for special-use coatings and general field painting.

1.3 DEFINITIONS

- A. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- B. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.
- B. Samples for Verification: For each type of coating system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Coatings: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

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 (7 deg C).
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

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. Diamond Vogel Paints.
 3. Glidden Professional.
 4. ICI Paints.
 5. Kwal-Howells Paint.
 6. PPG Architectural Finishes, Inc.
 7. Pratt & Lambert.
 8. Sherwin-Williams Company (The).
 9. Tnemec.

- B. Products: Subject to compliance with requirements, provide product listed in other Part 2 articles for the paint category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
 - 3. Provide products of same manufacturer for each coat in a coating system.
- C. Paint Colors (EP-X): Provide the following:
 - 1. Manufacturer: Sherwin Williams.
 - a. EP-1: SW7103 Whitetail.
 - b. EP-2: Custom match Pantone 293.

2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior: MPI #4.

2.4 INTERIOR PRIMERS/SEALERS

- A. Primer Sealer, Latex, Interior: MPI #50.

2.5 EPOXY COATINGS

- A. Epoxy, Gloss: MPI #77.
- B. Epoxy, High-Build, Low Gloss: MPI #108.

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.

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Masonry (Clay and CMU): 12 percent.
 - b. Gypsum Board: 12 percent.
- B. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates 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.
- C. Clean substrates of substances that could impair bond of coatings, 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 coating systems indicated.
- D. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 1. Use applicators and techniques suited for coating and substrate indicated.
 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 1. Contractor shall touch up and restore coated surfaces damaged by testing.
 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, 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 coated surfaces.

3.6 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. CMU Substrates:
 1. Epoxy System:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. Topcoat: Epoxy, gloss, MPI #77.

B. Gypsum Board Substrates:

1. Epoxy System:

- a. Prime Coat: Primer sealer, latex, interior, MPI #50.
- b. Intermediate Coat: Epoxy, gloss, MPI #77.
- c. Topcoat: Epoxy, gloss, MPI #77.

END OF SECTION 099600

SECTION 101100 - VISUAL DISPLAY SURFACES

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. Markerboards.
 - 2. Tackboards.

1.3 DEFINITIONS

- A. Tackboard: Framed, tackable, visual display board assembly.
- B. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes markerboards and tackboards.
- C. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.
- B. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of panel joints.
 - 2. Show locations of special-purpose graphics for visual display surfaces.
 - 3. Include sections of typical trim members.
- C. Samples for Verification: For each type of visual display surface indicated.
 - 1. Visual Display Surface: Not less than 8-1/2 by 11 inches (215 by 280 mm), mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.

- D. Maintenance Data: For visual display surfaces to include in maintenance manuals.
- E. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.
- B. 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. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-built visual display surfaces, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.
- B. Store visual display surfaces vertically with packing materials between each unit.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.
 - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.8 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which 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: Life of the building.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Porcelain-Enamel Face Sheet: Porcelain-enamel-clad, ASTM A 463/A 463M, Type 1, stretcher-leveled aluminized steel, with 0.024-inch (0.60-mm) uncoated thickness; with porcelain-enamel coating fused to steel at approximately 1000 deg F (538 deg C).
 1. Gloss Finish: Low reflective; dry-erase markers wipe clean with dry cloth or standard eraser. Suitable for use as projection screen.
- B. Fabric-Faced Tackboard: 1/4-inch- (6-mm-) thick, fabric-faced cork sheet factory laminated to 1/4-inch- (6-mm-) thick hardboard or particleboard backing.
- C. Particleboard: ANSI A208.1, Grade M-1, made with binder containing no urea formaldehyde.
- D. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.

2.2 MARKERBOARD ASSEMBLIES (MBD)

- A. Porcelain-Enamel Markerboards: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and 0.021-inch- (0.53-mm-) thick, magnetic, porcelain-enamel face sheet with low-glare finish.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AARCO Products, Inc.
 - b. Best-Rite Manufacturing.
 - c. Claridge Products and Equipment, Inc.
 - d. Ghent Manufacturing Inc.
 - e. Marsh Industries, Inc.; Visual Products Group.
 - f. Platinum Visual Systems; a division of ABC School Equipment, Inc.
 - g. PolyVision Corporation; a Steelcase company.
 2. Basis-of-Design: Subject to compliance with requirements, provide Claridge Products and Equipment, Inc.; LCS Markerboard.
 3. Particleboard Core: 1/2 inch (13 mm) thick; with 0.015-inch- (0.38-mm-) thick, aluminum sheet backing.
 4. Laminating Adhesive: Manufacturer's standard, moisture-resistant thermoplastic type.

2.3 TACKBOARD ASSEMBLIES (TBD)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AARCO Products, Inc.
 2. Best-Rite Manufacturing.
 3. Claridge Products and Equipment, Inc.
 4. Ghent Manufacturing, Inc.
 5. Marsh Industries, Inc.; Visual Products Group.
 6. Platinum Visual Systems; a division of ABC School Equipment, Inc.
 7. PolyVision Corporation; a Steelcase company.
- B. Fabric-Faced Tackboard: 1/4-inch- (6-mm-) thick, fabric-faced cork sheet factory laminated to 1/4-inch- (6-mm-) thick hardboard or particleboard backing.

2.4 MARKERBOARD ACCESSORIES

- A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; standard size and shape.
1. Factory-Applied Trim: Manufacturer's standard.
- B. Chalktray: Manufacturer's standard, continuous. (Locations without chalktrays noted on elevations)
1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.
- C. Map Rail: Provide the following accessories:
1. Display Rail: Continuous and integral with map rail; fabricated from cork approximately 1 to 2 inches (25 to 50 mm) wide.
 2. End Stops: Located at each end of map rail.

2.5 FABRICATION

- A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.
- B. Visual Display Boards: Factory assemble visual display boards unless otherwise indicated.
1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.
- C. Factory-Assembled Visual Display Units: All visual display units to be individually framed, unless noted to be frameless.
- D. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.6 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 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 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.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

2.8 VISUAL DISPLAY SURFACE SCHEDULE

- A. Visual Display Board (MBD): Factory assembled.
 1. Markerboard: Porcelain-enamel markerboard assembly.
 - a. Color: Manufacturer's standard white for a low-glare finish.
 2. Corners: Square.
 3. Width: As indicated on Drawings.
 4. Height: 4'-0".
 5. Mounting: Wall.
 6. Factory-Applied Aluminum Trim: Manufacturer's standard with clear anodic finish.
 7. Accessories:
 - a. Chalktray: Solid type.
 - b. Map rail with display rail, end stops and flag holder.
- B. Tackboard (TBD): Factory assembled.
 1. Tack Surface: Fabric-faced cork tackboard assembly.
 - a. Fabric: PF1
 - 1) Manufacturer: Carnegie; Xorel.
 - 2) Pattern: Meteor.
 - 3) Color: #6427-705.
 2. Corners: Square.
 3. Width: As indicated on Drawings.
 4. Height: 4'-0" general, unless otherwise indicated.
 5. Mounting: Wall.

6. Mounting Height: As indicated on Drawings.
7. Edges: Concealed by trim.
 - a. Factory-Applied Aluminum Trim: Manufacturer's standard style, with clear anodic finish.
 - 1) Color: Clear anodized aluminum.

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 roughing-in for electrical power systems to verify actual locations of connections before installation of motor-operated, sliding visual display units.
- C. Examine walls and partitions for proper preparation and backing for visual display surfaces.
- D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- E. 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 the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.
- 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 surfaces and wall surfaces.

3.3 INSTALLATION, GENERAL

- 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.
 1. Mounting Height for Grades 5th and 6th Grade: 36- inches (914 mm) above finished floor to top of chalktray.

3.4 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY BOARDS AND ASSEMBLIES

- A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches (400 mm) o.c. Secure both top and bottom of boards to walls.
 - 1. Field-Applied Aluminum Trim: Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at not more than 24 inches (610 mm) o.c.
 - a. Attach chalktrays to boards with fasteners at not more than 12 inches (300 mm) o.c.

3.5 INSTALLATION OF VISUAL DISPLAY WALL PANELS

- A. Marker Wall Panels: Attach panels to wall surface with egg-size adhesive gobs at 16 inches (400 mm) o.c., horizontally and vertically.
 - 1. Join adjacent wall panels with concealed steel splines for smooth alignment.
 - 2. Join adjacent wall panels with exposed, H-shaped aluminum trim painted to match wall panel.

3.6 CLEANING AND PROTECTION

- A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 101100

SECTION 101416 - PLAQUES

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 a dedication plaque to be located in the main vestibule. Coordinate with owner and Architect.

1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For plaques.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show plaque mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each plaque at least half size.
- C. Sample Warranty: For special warranty.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of plaques 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. Deterioration of embedded graphic image.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 PLAQUES

- A. Cast Plaque: Plaque with background texture, border, and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Manufacturer: Subject to compliance with requirements, provide product by one of the following:
 - a. Ace Sign Systems, Inc.
 - b. Allen Markings International.
 - c. APCO Graphics, Inc.
 - d. A. R. K. Ramos Signage Systems.
 - e. Diskey Sign Company.
 - f. Erie Landmark Company; Division of Paul W. Zimmerman Foundries.
 - g. Gemini Incorporated.
 - h. Matthews International Corporation; Bronze Division.
 - i. Metal Arts; Division of L & H Mfg. Co.
 - j. Metallic Arts.
 - k. Nelson-Harkins Industries.
 - l. Southwell Company (The).
2. Plaque Material: Cast aluminum.
3. Plaque Thickness: 0.50 inch (12.7 mm).
4. Size: 18 inches by 22 inches.
5. Finishes:
 - a. Integral Aluminum Finish: Medium bronze anodized finish to be lacquered for protection.
6. Background Texture: Leatherette.
7. Integrally Cast Border Style: Single line border with beveled edge.
8. Mounting: Concealed studs.
9. Text and Typeface: Satin finish letters and textured background. Letter style to be selected by the Architect from manufacturer's full range of styles. Lettering layout to be provided by the Architect at shop drawing stage.

2.3 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by plaque manufacturer for casting process used and for type of use and finish indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of plaques, noncorrosive and compatible with each material joined, and complying with the following:
1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. For exterior exposure, furnish nonferrous-metal, stainless-steel or hot-dip galvanized devices unless otherwise indicated.
 3. Plaque Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of plaque, screwed into back of plaque, or screwed into tapped lugs cast integrally into back of plaque, unless otherwise indicated.

2.5 FABRICATION

- A. General: Provide manufacturer's standard plaques according to requirements indicated.
1. Preassemble plaques in the shop to greatest extent possible. Disassemble plaques only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 5. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match plaque finish.
 6. 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.

2.6 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.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

- A. Medium Bronze Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of plaque work.
- B. Verify that plaque-support surfaces are within tolerances to accommodate plaques without gaps or irregularities between backs of plaques and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install plaques using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
 - 2. Install plaques so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
 - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of plaque. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place plaque in position and push until flush to surface, embedding studs in holes. Temporarily support plaque in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place plaque 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 plaques and plaques that do not comply with specified requirements. Replace plaques 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 plaques are installed.
- C. On completion of installation, clean exposed surfaces of plaques according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain plaques in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101416

SECTION 101419 – DIMENSIONAL LETTER SIGNAGE

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. Cast dimensional characters for exterior signage.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
 - 1. Provide message list for each sign, including large-scale details of wording, lettering, and artwork.
- C. Samples for Verification: For each type of sign, include the following Samples to verify color selected:
 - 1. Dimensional Characters: Full-size Samples of each type of dimensional character (letter and number) required. Show character style, material, finish, and method of attachment.
- D. Qualification Data: For Installer.
- E. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.5 COORDINATION

- A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
 - 1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

1.6 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.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

- A. Manufacturers: Subject to compliance with the requirements, provide products by one of the following:
 - 1. American Graphics Inc.
 - 2. A.R.K. Ramos.
 - 3. ASI Sign Systems, Inc.
 - 4. Gemini Incorporated.
 - 5. Metal Arts; Div. of L&H Mfg.
 - 6. Metallic Arts, Inc.
 - 7. Signature Sign Signs, Inc.
 - 8. Southwell Co. (The).
 - 9. Vomar Products, Inc.
- B. Cast Characters: Characters with uniform faces; sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Character Material: Cast aluminum.
 - 2. Character Height: 24-inches (609 mm).
 - 3. Thickness: Manufacturer's standard for size of character.
 - 4. Finishes:
 - a. Clear anodic finish.
 - 5. Mounting:

- a. Projecting studs that are concealed and to provide 1-inch space between back of characters and substrate.

6. Typeface: Arial as indicated on the Drawings.

2.2 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 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 range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.3 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items, including anchor inserts, provided under other sections of Work are sized and located to accommodate signs.
- C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
 1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
- B. Dimensional Characters: Mount characters using standard fastening methods recommended in writing by manufacturer for character form, type of mounting, wall construction, and condition

of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

1. Projecting studs at exterior.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 101419

SECTION 101423 - PANEL SIGNAGE

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. Panel signs.

1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For panel 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 others, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Sign Schedule: Use same designations specified or indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 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. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 PANEL SIGNS

- A. Product: Subject to compliance with requirements, provide the following or approved equal.
 - 1. Master Mark II; Vista System.
- B. Interior Panel Signs: Provide modular curved frame, complying with the following requirements:
 - 1. Extruded aluminum with clear anodized finish.

2. Laminated, Etched Photopolymer: Raised graphics with Braille 1/32 inch (0.8 mm) above surface with contrasting colors in finishes and color combinations indicated and laminated to acrylic back.
 3. Edge Condition: Manufacturer's standard.
 4. Corner Condition: Manufacturer's standard.
 5. Mounting: Framed, as indicated.
 - a. Wall mounted with two-face tape and silicone adhesive.
 - b. Manufacturer's standard anchors for substrates encountered.
 6. Color: As selected by the Architect from manufacturer's full range of colors.
 7. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch (0.8 mm) above surface with contrasting colors.
 - a. Color: Black.
- C. Brackets: Fabricate brackets and fittings for bracket-mounted signs from extruded aluminum to suit panel sign construction and mounting conditions indicated. Factory paint brackets in color matching Architect's sample.
- D. Panel Sign Frames:
1. Extruded-Aluminum Frames: With concealed anchors.
 - a. Product: Subject to compliance with requirements, provide Vista Signs; V200-WFP42 or approved equal.
 - 1) Color: Clear anodized aluminum with gray molded plastic end caps.
 - 2) Size: 7.87 inches wide by 5 inches high.
 - 3) Profile: Curved.
 - 4) Corner Condition: Square.
 - 5) Mounting: As indicated.
 - a) Wall mounted with two-face tape and silicone adhesive.
 - b. Product: Subject to compliance with requirements, provide Vista Signs; V150-WFP33 or approved equal.
 - 1) Color: Clear anodized aluminum with gray molded plastic end caps.
 - 2) Size: 5.90 inches wide by 8 inches high.
 - 3) Profile: Curved.
 - 4) Corner Condition: Curved.
 - 5) Mounting: As indicated.
 - a) Wall mounted with two-face tape and silicone adhesive.
- E. Changeable Message Inserts: Fabricate signs to allow insertion of changeable messages in the form of paper inserts.
- F. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with 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 (0.8 mm).

G. Colored Coatings for Photopolymer Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by photo polymer manufacturers for optimum adherence to acrylic surface and are UV and water resistant for five years for application intended.

1. Color: As selected by the Architect from manufacturer's full range of colors.

H. Panel Sign Schedule: See Drawings.

1. Sign Size: As indicated.
2. Message Panel Material: As indicated.
3. Message Panel Finish/Color: As selected by the Architect from manufacturer's full range of colors.
4. Background Finish/Color: As selected by the Architect from manufacturer's full range of colors.
5. Character Finish/Color: As selected by the Architect from manufacturer's full range of colors.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.

B. Adhesives: As recommended by sign manufacture.

C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.

D. Opaque sheet: Manufacturer's standard opaque backing sheet for mounting on glass to conceal fasteners and back side of sign. Match sign material and finish.

2.4 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.

3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.

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.

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 signage work.
- 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. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- 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. Install signs so they do not protrude or obstruct according to the accessibility standard.
 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Wall Mounted Signs: Install in locations on walls and adjacent to doors according to accessibility standard
- C. Mounting Methods:

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.
 2. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position and push to engage tape adhesive.
- D. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs 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 101423

SECTION 102113 - TOILET COMPARTMENTS

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. Toilet compartments configured as toilet enclosures, entrance screens and urinal screens.

- B. Related Sections:

- 1. Section 102800 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.

- 1. Show locations of cutouts for compartment-mounted toilet accessories.
 - 2. Show locations of reinforcements for compartment-mounted grab bars.
 - 3. Show locations of centerlines of toilet fixtures.

- C. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

- 1. Each type of material, color, and finish required for units, prepared on 6-inch- (152-mm-) square Samples of same thickness and material indicated for Work.
 - 2. Each type of hardware and accessory.

- D. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Comply with requirements in GSA's CID-A-A-60003, "Partitions, Toilets, Complete."

- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 75 or less.
 - 2. Smoke-Developed Index: 450 or less.

1.5 PERFORMANCE REQUIREMENTS

- A. Graffiti Resistance: Partition material shall have the following graffiti removal characteristics when tested in accordance with ASTM D 6578-00 Standard Practice for Determination of Graffiti Resistance in accordance with Section 9, "Graffiti Removal Procedure Using Manual Solvent Rubs."
 - 1. Cleanability: Five (5) required staining agents shall be cleaned off material.
- B. Scratch Resistance: Partition material shall have the following characteristics when tested in accordance with ASTM D 2197-98 (2002) Standard test Method for Adhesion of Organic Coating by Scrape Adhesion, using Gardner Stock #PA-2197/ST pointed stylus attachment on scrape tester.
 - 1. Scratch Resistance: Maximum Load Value shall exceed 10 kilograms.
- C. Impact Resistance: Partition material shall have the following characteristics when tested in accordance with ASTM D 2794-93 (1999) e1 Standard Test Method for Resistance of Organic Coating to the Effects of Rapid Deformation (Impact), using 0.625-inch hemispherical indenter with 2-lb impact weight.
 - 1. Impact Resistance: Maximum Impact Force value shall exceed 30 inch-lbs.
- D. Fire Resistance: Partition material shall comply with the following requirements, when tested in accordance with ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 1. Smoke Developed Index: Not to Exceed 450.
 - 2. Flame Spread Index: Not to exceed 75.
 - 3. Material Fire Ratings:
 - a. National Fire Protection Association (NFPA): Class B.
 - b. International Code Council (ICC): Class B.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- B. Stainless-Steel Castings: ASTM A 743/A 743M.

2.2 SOLID-COLOR REINFORCED COMPOSITE UNITS

- A. Product: Subject to compliance with requirements, provide the following:
 - 1. Manufacturer: Bobrick Partitions.
 - 2. Type: Sierra Series.
 - 3. Color:
 - a. TP-1: SC04 – Forest Green.
- B. Mounting Configurations:
 - 1. Toilet-Enclosure Style: Overhead braced; Bobrick Partitions; 1092 Sierra Series.
 - 2. Urinal-Screen Style: Wall hung; Bobrick Partitions; 1095 Sierra Series.
- C. Components and Materials:
 - 1. Stiles, Panels, Doors and Screens:
 - a. Stiles, panels, doors and screens shall all be manufactured from solid color reinforced composite material.
 - 2. Toilet Partition Material:
 - a. Toilet partitions shall be constructed of solid color reinforced composite material, composed of dyes, organic fibrous material, and polycarbonate/phenolic resins. Material shall have a non-ghosting, graffiti-resistant surface integrally bonded to core through a series of manufacturing steps requiring thermal and mechanical pressure. Edges of material shall be the same color as the surface.
 - 3. Finish Thickness:
 - a. Stiles and doors shall be 3/4-inch (19 mm).
 - b. Panels and benches shall be 1/2-inch (13 mm).
 - 4. Hardware:
 - a. All hardware to be 18/8, Type 304 stainless steel with satin finish.
 - b. Hardware of chrome-plated Zamak, aluminum, or extruded plastic is not acceptable.
 - c. Standard concealed stainless steel by same manufacturer.

5. Standard Latch:
 - a. Sliding door latch shall be 14 gauge (2 mm) and shall slide on nylon track.
 - b. Sliding door latch shall require less than 5-lb force to operate. Twisting latch operation is not acceptable.
 - c. Latch track shall be attached to door by machine screws into factory-installed threaded brass inserts.
 - d. Threaded brass inserts shall be factory installed for door hinge and latch connections and shall withstand a direct pull exceeding 1,500 lbs per insert.
 - e. Through bolted, stainless steel, pin-in-head Torx set bolt fasteners shall be used at latch keeper-to-stile connections and shall withstand direct pull force exceeding 1,500 lbs per fastener.
6. Coat Hook:
 - a. Coat hook shall be constructed of stainless steel and shall project no more than 1-1/8-inch (29 mm) from face of door.
 - b. Coat hook shall be secured to door by through-bolted, theft-resistant, pin-in-head Torx stainless steel screws. Through-bolted fasteners shall withstand a direct pull force exceeding 1,500 lbs per fastener.
7. Vandal-Resistant Mounting Brackets:
 - a. Mounting brackets shall be 18-gauge (1.2-mm) stainless steel and extend full height of panel.
 - b. U-channels shall be furnished to secure panels to stiles.
 - c. Angle brackets shall be furnished to secure stiles to walls and panels to walls.
 - d. Fasteners at locations connecting panels-to-stiles shall utilize through bolted, stainless steel, pin-in-head Torx sex bolt fasteners. Through-bolted fasteners shall withstand direct pull force exceeding 1,500 lbs per fastener.
 - e. Wall mounted urinal screen brackets shall be 11 gauge (3 mm) double thickness.
8. Leveling device shall be 7-gauge, 3/16-inch (5-mm) hot rolled steel bar; chromate-treated and zinc-plated; through-bolted to base of solid color reinforced composite stile.
9. Stile shoe shall be one-piece, 4 inches (102 mm) high, type 304, 22-gauge (0.8-mm) stainless steel with satin finish. Top shall have 90-degree return to stile. Shoe shall be composed of one piece of stainless steel and capable of being fastened by clip to stiles starting at wall line.
10. Headrail (overhead braced) shall be satin finish, extruded anodized aluminum (0.125-inch/3-mm thick) with anti-grip profile.

2.3 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging

doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 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 (13 mm).
- b. Panels and Walls: 1 inch (25 mm).

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 (44 mm) 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. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware 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 and doors in entrance screens to return doors to fully closed position.

END OF SECTION 102113

SECTION 102219 - DEMOUNTABLE PARTITIONS

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. Framing and trim components for demountable partition systems.

- B. Related Requirements:

- 1. Section 081416 "Flush Wood Doors" For door material and finish on doors in the demountable framing system.
 - 2. Section 087100 "Door Hardware" For hardware on doors in the demountable framing system.
 - 3. Section 088000 "Glazing" For types of glass in demountable framing system.
 - 4. Section 092900 "Gypsum Board" For sound-attenuation blankets in demountable framing system.

1.3 REFERENCES

- A. Reference Standards:

- 1. American Architectural Manufacturers Association (AAMA):
 - a. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.
 - 2. ASTM International (ASTM):
 - a. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - b. ASTM E413 Classification for Rating Sound Insulation.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate work of this Section with work of other trades for proper time and sequence to avoid construction delays.
- B. Preinstallation Meetings: Conduct preinstallation meeting prior to commencing on-site installations to verify project requirements, substrate conditions and coordination with other

building subtrades, and to review manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 ACTION SUBMITTALS

A. Product Data: Submit specified products as follows:

1. Manufacturer's product data, including manufacturer's SPEC-DATA product sheet.
2. Catalog pages illustrating products to be incorporated into project.
3. Material Safety Data Sheets (MSDS).

B. Shop Drawings: Indicate information on shop drawings as follows:

1. Layout of demountable partitions with plans and elevations that show solid panels, glazed panels, and doors.
2. Details of partition construction indicating framing, trim, glazing gasket, glass, panel, and insulating materials. Indicate finishes and colors of framing, trim, and glazing gasket components.
3. Details of anchorage to adjacent construction.

1.6 INFORMATION SUBMITTALS

A. Source Quality Control: Submit documentation verifying that components and materials specified in this Section are from single manufacturer.

B. Manufacturer's Instructions: Submit manufacturer's storage and installation instructions.

C. Manufacturer's Reports: Manufacturer's field reports specified.

D. Qualification Statements:

1. Submit letter of verification for Manufacturer's Qualifications.
2. Submit letter of verification for Installer's Qualifications.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Submit operation and maintenance data for installed products as follows:
 - a. Manufacturer's instructions detailing maintenance requirements.
 - b. Parts catalog giving showing complete list of available parts.
 - c. Replacement parts with cuts and identifying numbers.

B. Warranty Documentation: Submit warranty documents specified.

1.8 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer:

- a. 5 years' experience manufacturing components similar to or exceeding requirements of project.
- b. Having sufficient capacity to produce and deliver required materials without causing delay in work.
- c. Capable of providing field service representation during construction.

2. Installer: Acceptable to the manufacturer, experienced in performing work of this section and has specialized in installation of work similar to that required for this project.

1.9 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements:

1. Deliver materials in manufacturer's original packaging with identification labels intact and in sizes to suit project.

B. Storage and Handling Requirements:

1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1.10 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and does not limit, other rights Owner may have under other Contract Documents.

1. Warranty Term: 10 years commencing on date of substantial completion.

PART 2 - PRODUCTS

2.1 DEMOUNTABLE PARTITIONS

A. Basis-of-Design Product: Subject to compliance with requirements, provide NxtWall or an equal product by a preapproved manufacturer.

1. Contact: 5200 S. Sprinkle Road, Kalamazoo, MI 49002; Phone: 269-488-2752; Fax: 269-488-2754; e-mail info@nxtwall.com; website www.nxtwall.com.
2. Single Source Responsibility: Provide components and materials specified in this section from a single manufacturer.

B. Description:

1. Compatibility:
 - a. Ensure components and materials are compatible with specified accessories and adjacent materials.

C. Performance Criteria:

1. STC (ASTM E90, calculated in accordance with ASTM E413).

D. NxtFlex:

1. Floor/Ceiling Track:
 - a. Standard:
 - 1) Height: 1-9/16 inches.
 - 2) Width: 3-1/16 inches.
 - b. Tall:
 - 1) Height: 3 inches.
 - 2) Width: 3-1/16 inches.
 - c. Trim: 1-1/16 inches wide.

E. NxtDoor:

1. Height/Width:
 - a. Height: 84-inches.
 - b. Width: 36-inches.
 - c. Depth: 1-3/4 inches.
2. Door Material/Finish: Solid core wood door. Refer to Section 081416 "Flush Wood Doors" for door material and finish.
3. Door Frame: Clear anodized.
4. Door Hardware: Refer to Section 087100 "Door Hardware" for all door hardware except for door hinges, provide the following:
 - a. Door Hinges: NxtWall hinges 1-3/4 inch thick doors only.

F. Finishes:

1. Anodic (AAMA 611): Class II, coating not less than 0.4 mils thick.
 - a. Color: Clear.

2.2 ACCESSORIES

- A. Glazing: Clear tempered glass. Refer to Section 088000 "Glazing" for type of clear tempered glass.

- B. Glazing Bead: Manufacturer's standard PVC.
 - 1. Color: Black.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Verify that conditions of substrates previously installed under other sections or contracts are acceptable for product installation in accordance with manufacturer's instructions prior to demountable partition installation.
 - 1. Proceed with installation only after unacceptable conditions have been remedied.

3.2 PREPARATION

- A. Ensure structure or substrate is adequate to support demountable partitions.
- B. Surface Preparation: Prepare surface in accordance with manufacturer's written recommendations.

3.3 INSTALLATION

- A. Coordinate demountable partition work with work of other trades for proper time and sequence to avoid construction delays.
- B. Install demountable partitions plumb and level.
- C. Accurately fit, align, securely fasten and install free from distortion or defects.

3.4 ADJUSTING

- A. Adjust components and systems for correct function and operation in accordance with manufacturer's written instructions.
- B. Lubricate moving parts to operate smoothly and fit accurately.

3.5 CLEANING

- A. Upon completion, remove surplus materials, rubbish, tools and equipment.
- B. Waste Management:
 - 1. Collect recyclable waste and dispose of or recycle field generated construction waste created during demolition, construction or final cleaning.
 - 2. Remove recycling containers and bins from site.

3.6 PROTECTION

- A. Protect installed product from damage during construction.
- B. Repair damage to adjacent materials caused by installation.

END OF SECTION 102219

SECTION 102239.13 - FOLDING GLASS-PANEL PARTITIONS

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 manually operated, glass-panel partitions.
- B. Related Requirements:
 - 1. Section 088000 "Glazing."

1.3 DEFINITIONS

- A. STC: Sound Transmission Class.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For operable glass-panel partitions.
 - 1. Include plans, elevations, sections, details, numbered panel installation sequence, and attachments to other work.
 - 2. Indicate stacking 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.
 - 1. Include Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed material, finish, covering, or facing, prepared on Samples of size indicated below:
 - 1. Panel Edge Material: Not less than 3 inches (75 mm) long.
 - 2. Glass: Units 12 inches (300 mm) square.

3. Hardware: One of each exposed door-operating device.
- E. Delegated-Design Submittal: For operable glass-panel partitions.
1. Include design calculations for seismic restraints.

1.6 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. Partition track, track supports and bracing, switches, turning space, and storage layout.
 2. Structural members to which suspension systems are attached.
- B. Setting Drawings: For embedded items and cutouts required in other work, including support-beam, mounting-hole template.
- C. Qualification Data: For qualified Installer.
- D. Seismic Qualification Certificates: For operable glass-panel partitions, tracks, accessories, and components, from manufacturer. Include seismic capacity of partition assemblies to remain in vertical position during a seismic event and the following:
1. Basis for Certification: Indicate whether certification is based on analysis, testing, or experience data, according to ASCE/SEI 7.
 2. Detailed description of partition anchorage devices on which the certification is based and their installation requirements.
- E. Product Certificates: For each type of operable glass-panel partition.
- F. Product Test Reports: For each operable glass-panel partition, for tests performed by a qualified testing agency.
- G. Sample Warranty: For manufacturer's special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For operable glass-panel partitions to include in maintenance manuals.
1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Panel finish and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
 - b. Seals, hardware, track, track switches, carriers, and other operating components.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Preparation of the opening shall conform to the criteria set forth per ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.
- C. Glass shall be clear tempered per ASTM C1048-92.

1.9 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.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of operable glass-panel partitions that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of operable glass-panel partitions.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Period: One (1) year 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 seismic bracing of tracks to structure above.
- B. Seismic Performance: Operable glass-panel partitions shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the partition 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 glass-panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
 - 1. Supply a copy of the acoustical test report certifying that the partition was tested by an independent accredited laboratory. The partition tested must be fully functional, sized at 14'0" x 8'5" [4267 mm x 2591 mm] and meet ASTM-E90 standard. The test results must be similar to or exceed the performance specified. Sound tests performed on a single

panel or on a non-functional partition will not be accepted. Any sound test not showing panel construction details and weight or not disclosing all of the information will not be valid. All equivalence requests must include complete technical information, a list of 3 similar projects already carried out as well as a copy of the appropriate acoustical performance sound test, at least 10 days before closing of the bids. The manufacturers must also guarantee that the products proposed have the same characteristics as the products specified and are in accordance with the drawings. Standard panel construction shall have obtained an STC rating of 44.

2.2 OPERABLE GLASS PANELS

- A. Operable Glass Panels: Aluminum-framed glass-panel partition system, including panels, seals, suspension system, operators, and accessories.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Hufcor GA2, or comparable product by one of the following:
 - 1. Hufcor, Inc.
 - 2. Moderco Inc.
 - 3. Modernfold, Inc.
 - 4. NanaWall Systems, Inc.
- C. Panel Operation: Manually operated, paired panels.
- D. Panel Construction: As required to support panel from suspension components and with 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. Factory-Glazed Fabrication: Glaze operable glass panels in the factory where practical and possible for applications indicated. Comply with manufacturer's written instructions and with requirements in Section 088000 "Glazing."
- E. Glass and Glazing: As follows:
 - 1. Safety Glass Standard for Partition Panels: Provide glass products complying with testing requirements in 16 CFR 1201, Category II, or ANSI Z97.1, Class A.
 - 2. Safety Glass Standard for Pass Doors: Provide glass products complying with testing requirements in 16 CFR 1201, Category II.
 - 3. Glass: Manufacturer's standard safety glass and glass assemblies as indicated and complying with requirements in Section 088000 "Glazing".
 - a. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass as indicated, separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
 - 1) Spacer: Manufacturer's standard spacer construction and material.
 - b. Glass Thickness: Manufacturer's standard thickness.

4. Glazing System: Manufacturer's standard factory-glazing system that produces acoustical seal.
 5. The glass faces shall be factory installed sealed double glazed tempered glass unit with a weight of 9 lbs. per sq. ft.
- F. Dimensions: Fabricate operable glass-panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
1. Panel Width: As indicated.
- G. Panel Frame Thickness: 3 inches (76 mm).
- H. Panel Frame Materials:
1. Panels shall be full perimeter extruded aluminum frame with interlocking corner construction reinforced by means of concealed steel corner brackets. Glazing seals and gaskets shall be snap-on and shaped to suit the glass configuration and thickness. Frame Reinforcement: Manufacturer's standard steel or aluminum.
- I. Panel Closure:
1. The leading vertical edge of each panel shall incorporate a tongue with two vinyl gaskets to nest into the vertical recess in the edge of the adjoining panel, creating a positive, interlocking joint for panel stability, ease of panel alignment and sound seal.
 2. Top and bottom horizontal seals shall be continuous contact, multilayer, vinyl sweep seals. The top seals maintain contact with the track and the bottom seals maintain contact with the floor or other surface along the path of the movable wall. The bottom rail height is a nominal 4 inches.
 3. Optional bottom horizontal retractable seals to be operated by a removable handle located approximately 11 inches from the floor at panel edge. Automatic or foot pedal type activation of seals is not acceptable. Operation of the seals requires no more than 180-degree turn of the handle. Horizontal bottom seals to provide 1 inch nominal operating clearance for easier panel movement and to accommodate a deflection of the support beam or out-of-level floor. A stabilizing downward pressure must be exerted when seals
 4. Final partition closure to be by a full height hinged panel at one end of the opening that hinges from a fixed two piece telescopic aluminum jamb. The hinged panel shall be fitted with a lever type latchset or lockset. The lead end of the partition shall butt against a two piece extruded aluminum wall jamb that will compensate for an out-of-plumb condition of (+) or (-) 3/8 inch.
- J. Hardware: Manufacturer's standard as required to operate operable glass-panel partition and accessories; with decorative, protective finish.
1. Hinges: Manufacturer's standard.
- K. Panel Frame Finishes:
1. Exposed Metal:
 - a. Aluminum: Clear anodized.

2.3 SEALS

- A. General: Provide seals that produce operable glass-panel partitions complying with performance requirements and the following:
 - 1. Manufacturer's standard seals unless otherwise indicated.
 - 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 glass-panel partition perimeter and adjacent surfaces, when operable glass-panel partition is extended and closed.

2.4 SUSPENSION SYSTEMS

- A. Track shall be of clear anodized architectural grade extruded aluminum alloy 6063-T6. Track design shall provide precise alignment at the trolley running surfaces and provide integral support for adjoining ceiling, soffit, or plenum sound barrier. Track shall be connected to the structural support by pairs of minimum 3/8-inch diameter threaded steel hanger rods. Guide rails and/or track sweep seals shall not be permitted. a. Each panel shall be supported by one 4-wheeled carrier. Wheels to be of hardened steel ball bearings encased with molded polymer tires.
- B. Carriers: Trolley system as required for configuration type, size and weight of partition and for easy operation with ball-bearing wheels.
 - 1. Multidirectional Carriers: Capable of negotiating intersections without track switches.

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 glass-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 glass-panel partition manufacturer's written installation instructions.
- B. Install operable glass-panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.
- 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.
- F. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and bottom seals for voids. Adjust partitions for alignment and full closure of vertical joints and full closure along top and bottom seals.

3.3 ADJUSTING

- A. Adjust operable glass-panel partitions, hardware, and other moving parts to function smoothly, and lubricate as recommended by manufacturer.
- B. Verify that safety devices are properly functioning.

3.4 MAINTENANCE SERVICE

- A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operable-partition operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable glass-panel partitions.

END OF SECTION 102239.13

SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Corner guards.

1.3 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.

- 1. Include plans, elevations, sections, and attachment details.

- C. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified.

- 1. Include Samples of accent strips and accessories to verify color selection.

1.4 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 (21 deg C) during the period plastic materials are stored.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:

- a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
 - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E 84 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 (CG): Fabricated from one-piece, formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Floor Products Co., Inc.
 - b. Arden Architectural Specialties, Inc.
 - c. Balco, Inc.
 - d. Construction Specialties, Inc.
 - e. IPC Door and Wall Protection Systems; Division of InPro Corporation.
 - f. Korogard Wall Protection Systems; a division of RJF International Corporation.
 - g. Pawling Corporation.
 2. Material: Stainless steel, Type 304.
 - a. Thickness: Minimum 0.0625 inch (1.6 mm).
 - b. Finish: Directional satin, No. 4.
 3. Wing Size: Nominal 2-1/2 by 2-1/2 inches (65 by 65 mm).
 4. Corner Radius: 1/8 inch (3 mm).
 5. Height: From top of rubber base to 5 feet above the finished floor.
 6. Mounting: Adhesive.

2.3 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M.

- B. Adhesive: Type recommended by manufacturer for use with material being adhered to substrate indicated.
 - 1. Use adhesives and sealants that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Gypsum Board and Panel Adhesives: 50 g/L.
 - b. Multipurpose Construction Adhesives: 70 g/L.
 - c. Contact Adhesive: 250 g/L.

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.

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

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Public-use washroom accessories.
2. Public-use shower room accessories.
3. Underlavatory guards.
4. Custodial accessories.
5. Childcare accessories.

- B. Related Sections include the following:

1. Section 102113 "Toilet Compartments" for compartments and screens.

1.3 ACTION 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.
2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.7 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.

1.8 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 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. 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.

- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. A & J Washroom Accessories, Inc.
 - 2. American Specialties, Inc.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation.
 - 5. General Accessory Manufacturing Co. (GAMCO).
 - 6. Hospeco
 - 7. Impact Products, LLC.
 - 8. San Jamar.
 - 9. Tork, USA.
- B. Toilet Tissue (Roll) Dispenser TTD:
 - 1. Basis-of-Design Product: Tork; 59TR.
 - 2. Description: Double-roll dispenser, horizontal.
 - 3. Mounting: Surface mounted.
 - 4. Operation: Spindleless with tension-spring controlled delivery and self-locking device extending through core that prevents core removal until roll is empty.
 - 5. Capacity: Designed for 5-inch- (127-mm-) diameter tissue rolls.
 - 6. Material and Finish: Plastic, smoke.
- C. Paper Towel (Rolled) Dispenser (PTD):
 - 1. Basis-of-Design Product: San Jamar; T850TBK.
 - 2. Mounting: Surface mounted.
 - 3. Minimum Capacity: 8-1/4-inch wide rolls with 8-1/2-inch diameter.
 - 4. Material and Finish: Plastic, black.
 - 5. Lockset: Key lock.
- D. Liquid-Soap Dispenser (SD):
 - 1. Basis-of-Design Product: Impact Products; 9325.
 - 2. Description: Designed for dispensing soap in lotion form.
 - 3. Mounting: Vertically oriented, surface mounted.
 - 4. Capacity: 34 oz.
 - 5. Materials: ABS construction.
 - 6. Lockset: Key lock.
 - 7. Refill Indicator: Window type.
 - 8. Color: White.

E. Hand Sanitizer Dispenser (HSD):

1. Basis-of-Design Product: Impact Products; 9326.
2. Description: Designed for dispensing sanitizer in lotion form.
3. Mounting: Vertically oriented, surface mounted.
4. Capacity: 34 oz.
5. Materials: ABS construction.
6. Lockset: Key lock.
7. Refill Indicator: Window type.
8. Color: Black.
9. Location: Locate in classrooms and collaboration spaces per Owner direction.
10. Quantity: 26

F. Grab Bar (GB-1, GB-2, GB-3):

1. Basis-of-Design Product: Bobrick B-6806.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
 - a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches (38 mm).
5. GB-1 Provide 36-inches on back wall.
6. GB-2 Provide 42-inches on the side wall.
7. GB-3 Provide 18-inch vertical bar.
8. GB-4 See shower accessories.

G. Sanitary-Napkin Disposal Unit (SND):

1. Basis-of-Design Product: Impact Products; 1103
2. Mounting: Surface mounted.
3. Door or Cover: Self-closing disposal-opening cover.
4. Receptacle: Removable.

H. Material and Finish: Plastic, black. Sanitary-Napkin/Tampon Vendor (SNV):

1. Basis-of-Design product: Bobrick B-3706
2. Mounting: Semi-recessed mounted.
3. Capacity: Manufacturer's standard.
4. Operation: Single coin (25 cents).
5. Exposed Material and Finish: Stainless steel, No. 4 finish (satin).
6. Lockset: Tumbler type with separate lock and key for coin box.

I. Mirror Unit (MR-1, MR-2):

1. Basis-of-Design Product: Bobrick B-165-1836 and Bobrick B-165-2460
2. Frame: Stainless-steel channel.
 - a. Corners: Manufacturer's standard.

3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
 - c. Mounting Height: 40" to bottom when over sink; 35" to bottom when not over sink.
4. MR-1 Size: 18-inches wide by 36-inches tall.
5. MR-2 Size: 24-inches wide by 60-inches tall.

2.3 PUBLIC-USE SHOWER ROOM ACCESSORIES

- A. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 1. A & J Washroom Accessories, Inc.
 2. American Specialties, Inc.
 3. Bobrick Washroom Equipment, Inc.
 4. Bradley Corporation.
 5. General Accessory Manufacturing Co. (GAMCO).
- B. Shower Curtain Rod (SCR):
 1. Basis-of-Design Product: Bobrick B-6047.
 2. Description: 1-1/4-inch (32-mm) OD; fabricated from nominal 0.05-inch- (1.3-mm-) thick stainless steel.
 3. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
 4. Finish: No. 4 (satin).
- C. Shower Curtain (SC):
 1. Basis-of-Design Product: Bobrick B-204.
 2. Size: Minimum 6 inches (152 mm) wider than opening by 72 inches (1828 mm) high.
 3. Material: Vinyl, minimum 0.006-inch- (0.15-mm-) thick, opaque, matte.
 4. Color: As selected from manufacturer's full range.
 5. Grommets: Corrosion resistant at minimum 6 inches (152 mm) o.c. through top hem.
 6. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.
- D. Folding Shower Seat (FSS):
 1. Basis-of-Design Product: Bobrick B-5181.
 2. Configuration: L-shaped seat, designed for wheelchair access.
 3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.

4. Mounting Mechanism: Stainless steel, No. 4 finish (satin).

E. Grab Bar (GB-3):

1. Basis-of-Design Product: Bobrick B-6861.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
 - a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches (38 mm).
5. Configuration and Length: As indicated on Drawings.

F. Robe Hook (RH):

1. Basis-of-Design Product: Bobrick B-677.

G. Material and Finish: Stainless steel, No. 4 finish (satin).

2.4 UNDERLAVATORY GUARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

B. Underlavatory Guard:

1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded plastic, white.

2.5 CUSTODIAL ACCESSORIES

A. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. General Accessory Manufacturing Co. (GAMCO).

B. Mop and Broom Holder (MBH):

1. Basis-of-Design Product: Bobrick B-239 x 34.
2. Description: Unit with shelf, hooks and holders suspended beneath shelf.

3. Length: 34 inches (865 mm).
4. Mounting Height: 60" to shelf.
5. Hooks: Four.
6. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
7. Material and Finish: Stainless steel, No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch- (1.3-mm-) thick stainless steel.

2.6 CHILDCARE ACCESSORIES

- A. Source Limitations: Obtain childcare accessories from single source from single manufacturer.
- B. Diaper-Changing Station (BCS):
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Specialties, Inc.
 - b. Diaper Deck & Company, Inc.
 - c. Foundations Children's Products.
 - d. GAMCO Specialty Accessories; a division of Bobrick.
 - e. Koala Kare Products.
 - f. SafeStrap Company, Inc. (SSC, Inc.).
 - g. Tubular Specialties Manufacturing, Inc.
 2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
 - a. Engineered to support minimum of 250-lb (113-kg) static load when opened.
 3. Mounting: Surface mounted, with unit projecting not more than 4 inches (100 mm) from wall when closed.
 4. Operation: By pneumatic shock-absorbing mechanism.
 5. Material and Finish: Stainless steel, No. 4 finish (satin), with replaceable insulated polystyrene tray liner and rounded plastic corners.
 6. Liner Dispenser: Built in.

2.7 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to 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 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Fire-protection cabinets for the following:
 - a. Portable fire extinguisher.

- B. Related Requirements:

- 1. Section 104416 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
- 2. Show location of knockouts for hose valves.

- B. Shop Drawings: For fire-protection cabinets.

- 1. Include plans, elevations, sections, details, and attachments to other work.

- C. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

2.2 FIRE-PROTECTION CABINET (FEC)

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Fire-End & Croker Corporation.
 - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - c. Larsens Manufacturing Company.
 - d. Modern Metal Products, Division of Technico Inc.
 - e. Nystrom, Inc.
 - f. Potter Roemer LLC.
 - g. Strike First Corporation of America.
- B. Cabinet Construction: Nonrated.
- C. Cabinet Material: Cold-rolled steel sheet.
 - 1. Shelf: Same metal and finish as cabinet.
- D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - 1. Rolled-Edge Trim: 2-1/2-inch (64-mm) backbend depth.
- 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 door pull and friction latch.
2. Provide continuous hinge, of same material and finish as trim, 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. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - a. Location: Applied to cabinet door.
 - b. Application Process: Silk-screened.
 - c. Lettering Color: Red.
 - d. Orientation: Vertical.
3. Alarm: Manufacturer's standard alarm that actuates when fire-protection cabinet door is opened and that is powered by batteries.

K. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel or powder coat.
 - b. Color: As selected by Architect from full range of industry colors and color densities.
2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.3 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
 2. Fabricate door frames of one-piece construction with edges flanged.
 3. Miter and weld perimeter door frames and grind smooth.

- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for hose valves, racks and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated
 - 1. Fire-Protection Cabinets: 54 inches (1372 mm) above finished floor to top of fire extinguisher.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- C. Identification: Apply decals at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

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 portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.
- B. Related Requirements:
 - 1. Section 104413 "Fire Protection Cabinets."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 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 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "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 FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated.
 - c. Badger Fire Protection.
 - d. Buckeye Fire Equipment Company.
 - e. Fire End & Croker Corporation.
 - f. Guardian Fire Equipment, Inc.
 - g. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - h. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
 - i. Larsens Manufacturing Company.
 - j. Moon American.
 - k. Nystrom Building Products.
 - l. Pem All Fire Extinguisher Corp.
 - m. Potter Roemer LLC.
 - n. Pyro-Chem; Tyco Safety Products.
 - o. Strike First Corporation of America.

2. Valves: Manufacturer's standard.
 3. Handles and Levers: Manufacturer's standard.
 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 1. Mounting Brackets: Top of fire extinguisher to be at 54 inches (1372 mm) above finished floor.

END OF SECTION 104416

SECTION 105113 - METAL LOCKERS

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. Athletic lockers, combination lockers as follows:
 - a. Triple tier: 15 inches wide by 15 inches deep by 20 inches tall.
 - b. Wood benches with metal supports.
- B. Related Sections include the following:
 - 1. Section 033000 "Cast-in-Place Concrete" for concrete bases.
 - 2. Section 061053 "Miscellaneous Rough Carpentry" for wood furring and grounds.
 - 3. Section 096513 "Resilient Base and Accessories" for resilient base where indicated.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.
 - 1. Show locker fillers, trim, base, sloping tops, and accessories. Include locker-numbering sequence.
- C. Samples for Verification: For the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected. Prepare Samples from the same material to be used for the Work.
 - 1. Lockers.
- D. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain locker units and accessories through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver lockers until spaces to receive them are clean, dry, and ready for locker installation.
- B. Protect lockers from damage during delivery, handling, storage, and installation.
- C. Deliver master keys, control keys, and combination control charts to Owner.

1.6 COORDINATION

- A. Coordinate size and location of concrete bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - 1. Art Metal Products; Div. of Fort Knox Storage Co.
 - 2. ASI Storage Solutions, ASI Group.
 - 3. DeBourgh Manufacturing Co.
 - 4. Hadrian Manufacturing, Inc.
 - 5. List Industries, Inc.
 - 6. Lyon Metal Products, Inc.
 - 7. Penco Products, Inc.; Subsidiary of Vesper Corporation.
 - 8. Republic Storage Systems Co., Inc.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 366/A 366M, matte finish, suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.
- B. Galvanized Steel Sheet: ASTM C 653/A 653M, commercial quality, G60 (Z180) coating designation; mill phosphatized; suitable for exposed applications, and stretcher leveled or roller leveled to stretcher leveled flatness.
- C. Fasteners: Zinc- or nickel-plated steel, slotless-type exposed bolt heads, and self-locking nuts or lock washers for nuts on moving parts.

2.3 ATHLETIC LOCKERS (WELDED CONSTRUCTION)

- A. Body: Form tops and bottoms from minimum 16 gage, 0.0598 inch thick steel sheet.
 - 1. Perforated-Metal Backs: Form backs from minimum 16 gage, 0.0598 inch thick steel sheet, with manufacturer's standard perforations; rectangular, round, square, diamond.
 - 2. Perforated-Metal Sides and Intermediate Partitions: Form backs from minimum 16 gage, 0.0598 inch thick steel sheet, with manufacturer's standard perforations; rectangular, round, square, diamond.
- B. Frames: Form welded frames from minimum 16 gage (0.0598 inch) thick, steel sheet channels or minimum 12 gage (0.1046-inch-) thick steel angles.
 - 1. Hooks: Form from minimum 12 gage, 0.1046-inch- thick steel; welded or riveted to door frames.
 - 2. Cross Frames: Form intermediate channel cross frames between tiers from minimum 16 gage, 0.0598 inch thick steel sheet. Weld to vertical frame members.
- C. Perforated Steel Doors: Form doors from one-piece perforated steel sheet with flanged edges, complying with the following:
 - 1. Sheet Thickness: 16 gage, 0.0598 inch minimum.
 - 2. Reinforcement: Brace or reinforce inner face of doors more than wide.
 - 3. Perforations: Provide manufacturer's standard perforations; rectangular, round, square, or diamond.
- D. Continuous Hinges for Athletic Lockers: Manufacturer's standard, steel continuous hinge, side or top mounted to door and frame.
- E. Recessed Handle and Latch: Manufacturer's standard housing, formed from 20 gage thick nickel-plated steel or stainless steel, with integral door pull, recessed for latch lifter and locking devices; nonprotruding latch lifter; and automatic, prelocking, pry-resistant latch, as follows:
 - 1. Provide minimum three-point latching for each door more than 42 inches (1067 mm) high; minimum two-point latching for each door 42 inches (1067 mm) high or less.

2.4 LOCKS

- A. Fabricate lockers to receive the following locking devices, installed on lockers using security-type fasteners:
 - 1. Combination Padlocks for Athletic Lockers at Locker Rooms: Padlocks provided by others.

2.5 LOCKER ACCESSORIES

- A. Interior Equipment: Furnish each locker with the following items, unless otherwise indicated:

1. Hooks: Manufacturer's standard zinc-plated, ball-pointed steel. Provide one double-prong ceiling hook, and not fewer than two single-prong wall hooks for single-, double-, and triple-tier units. Attach hooks with at least two fasteners.
- B. Number Plates: Manufacturer's standard etched, embossed, or stamped, aluminum number plates with numerals at least 3/8 inch high. Number lockers in sequence indicated. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
- C. Concrete Base at Lockers: 4 inch high concrete base under locker layout.
- D. Continuously Sloping Tops: Manufacturer's standard, fabricated from minimum 16 gage steel sheet, for installation over lockers with separate flat tops. Fabricate tops in lengths as long as practicable, without visible fasteners at splice locations, finished to match lockers. Provide fasteners, filler plates, supports, and closures, as follows:
 1. Closures: Vertical-end type.
 2. Sloped top corner fillers, mitered.
 3. Slope tops at 25 degree pitch.
- E. Filler Panels: Fabricated from minimum 14 gage steel sheet in an unequal leg angle shape and finished to match lockers.

2.6 FABRICATION

- A. All-Welded Construction (Athletic Lockers at Locker Rooms): Preassemble lockers by welding all joints, seams, and connections, with no bolts, screws, or rivets used in assembly. Grind exposed welds flush.
- B. Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch. Weld frame members together to form a rigid, one-piece assembly.
 1. Form locker-body panels, doors, shelves and accessories from one-piece steel sheet.

2.7 FINISHES, GENERAL

- A. Finish all steel surfaces and accessories, except prefinished stainless-steel and chrome-plated surfaces.
- B. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- 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.

2.8 STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond. Use manufacturer's standard methods.
- B. Powder-Coated Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer finish consisting of a thermosetting powder topcoat. Comply with paint 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 the Architect from manufacturer's full range of standard colors.

2.9 WOOD BENCHES

- A. Wood Bench:
 - 1. Dimensions: 1'-3" wide, 7'-0" long, 2-inch depth
 - 2. Finish: Hardwood clear stained to match wood doors.
 - 3. Mounting: Round steel supports attached to floor at each end and in the middle. Mounting height is 24 inches above finished floor.
 - 4. ADA Bench: 18 inches by 3'-0".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine concrete bases for suitable conditions where metal lockers are to be installed.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install metal lockers and accessories level, plumb, rigid, and flush according to manufacturer's written instructions.
- B. Connect groups of all-welded lockers together with standard fasteners, with no exposed fasteners on face frames.
- C. Anchor lockers to concrete bases and walls at intervals recommended by manufacturer, but not more than 36 inches o.c. Install anchors through backup reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.
- D. Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 1. Attach sloping top units to lockers, with closures at exposed ends.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.
- B. Clean interior and exposed exterior surfaces and polish stainless-steel and nonferrous-metal surfaces.
- C. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.
- D. Touch up marred finishes or replace locker units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

3.4 METAL LOCKER PRODUCT DATA SHEET

- A. Locker Designation: Type A.
- B. Locker Classification: Athletic Lockers.
- C. Locker Material: Zinc-coated steel sheet.
- D. Locker Fabrication: Welded construction.
- E. Locker Arrangement: Triple tier.
- F. Size: 15 inches W x 15 inches D x 20 inches H.
- G. Hinges: Heavy duty.
- H. Sides/Backs: Sides perforated metal, backs solid.
- I. Base: No base required, concrete base provided; Re: Drawings.
- J. Handle/Latch: Recessed.
- K. Locking: Combination padlock, padlock by others.
- L. Color: Selected by the Architect from manufacturer's full range of colors.
- M. Products: Provide lockers from one of the manufacturers listed in Part 2.

END OF SECTION 105113

SECTION 10530 - SHADE STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

- A. Commercial prefabricated shade structures.

1.3 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete: footings.

1.4 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 1996.
- B. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International; 1999.
- C. ASTM A 135 - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2001.
- D. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 1999.
- E. ASTM E 8 - Test Methods for Tension Testing of Metallic Materials; 2004.
- F. CRSI (DA4) - Manual of Standard Practice; Concrete Reinforcing Steel Institute; 1997, 26th Edition.

1.5 SUBMITTALS required from awardee

- A. See Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's descriptive literature for specified systems, including all components.
- C. Shop Drawings: Indicate layout heights, component connection details, and details of interface with adjacent construction.

- D. Complete engineering analysis shall be certified and sealed by a Professional Engineer registered in the State where the shade structure is being constructed.
- E. Selection Samples: Two sets of color chips representing manufacturer's full range of available colors.
- F. Certificates:
 - 1. Contractor's certification that manufacturer of products of this section meet specified qualifications.
 - 2. Manufacturer's certification that installer of this section is approved.
- G. Manufacturer's printed installation instructions for specified systems, including each component.
- H. Provide manufacturer's data verifying compliance of the knitted 100% HDPE membrane system with this specification.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum ten (10) years of documented experience producing systems of the types specified in this section.
- B. Installer Qualifications: Minimum three (3) years documented experience installing systems of the types specified in this section, and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store system components in accordance with manufacturer's instructions until installation.

1.8 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Warrant that the equipment sold will conform in kind and quality to the specifications listed and will be free of defects in workmanship or materials. Shade manufacturer shall further warrant the following:
 - 1. LIMITED 20 YEAR WARRANTY on all upright posts, and support structure frames against failure due to rust-through corrosion.
 - 2. LIMITED 10 YEAR WARRANTY on all fabrics and stitching threads against degradation, cracking or material breakdown resulting from ultra-violet exposure.

PART 2 - PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Specified Manufacturer: Solar Shade USA, LLC: Tel: (417) 395-4500; Fax: (417) 395-4515.

2.2 GENERAL

- A. All materials shall be structurally sound and appropriate for safe use.
- B. Fabrics used shall include UV-stabilizers and fire retardants as required to meet performance and building code requirements.

2.3 DESIGN

- A. Styles: Square, Rectangle, Cantilever, Single Post Umbrella and custom shade sails.
- B. Size and Height: As indicated in the Request for Quotation / Drawings.
- C. Engineering Data: Structures are engineered to meet or exceed the requirements of the International Building Code (IBC), and the following standard specifications:
 - 1. Wind Speed (Frame with Canopy): 90 miles per hour.
 - 2. Live Load: 5 psf.
 - 3. Snow Load: None

2.4 WELDMENTS

- A. All tubing members shall be factory-welded to American Welding Society (AWS) specifications and to the highest standards of quality workmanship.
- B. After fabrication all welded areas shall be primed with zinc rich powder coat and cured in accordance with the powder coat manufacturer's specifications.
- C. Drilling or welding in the field shall not be permitted.

2.5 POSTS, STRUCTURAL FRAME TUBING, AND HARDWARE

- A. All tubing used shall be cold-formed and milled per ASTM A 135 and ASTM A 500.
- B. Material testing shall be in accordance with ASTM E 8.
- C. Minimum yield shall be 40,000 psi with a minimum tensile strength of 45,000 psi on all posts.
- D. All pipe / tubing up to 5" O.D. shall be as manufactured with an in line Flo-coat galvanizing process as used by Allied Tube, or approved equal. Pipe sizes above 5" O.D. shall be primed with zinc powder coat, oven cured and then final color powder coated.

- E. All edges of tube, pipe, cleats, and plate, including all punched or drilled holes shall have a radius sufficient to allow powder coat to cover all exposed surfaces with a minimum of 2 mils fully cured powder coat. Full assembly must be accomplished without drilling after the components are powder coated.
- F. Finish: All steel components, other than stainless steel and hot dipped galvanized hardware, shall receive specified zinc power coat primer and specified color finish powder coat.
- G. All fastening hardware shall be 316 stainless steel or hot-dipped galvanized.
- H. Structure shall include an integrated dynamic tensioning system to tension and easily remove fabric.
 - 1. All connections shall be designed for assembly with standard hand tools.

2.6 POLYESTER POWDER-COATING PROCESS

- A. The surface preparation shall be in accordance with the powder coat manufacturer's recommendations for the material being coated. There shall be no more than four hours time lapse between the surface preparation and the application of powder coat.
- B. Minimum dry film thickness for the zinc primer shall be 2 mils and for the finish color shall be 2 mils.
- C. The individual steel components shall be powder coated with the specified color and heat cured in a batch oven in accordance with the paint manufacturer's specifications.
- D. The powder coat finish shall be uniform and continuous with no voids or puddles and shall not be broken by scratches or nicks.
- E. Polyester powders shall meet or exceed ASTM standards for Adhesion, Hardness, Impact, Flexibility, Over Bake Resistance, and Salt Spray Resistance.
- F. Color shall be selected by Owner from manufacturer's standard colors.

2.7 FOOTINGS

- A. Footings shall be designed and constructed to local building codes and good construction practices and shall meet the requirements of Section 03300.
- B. Columns shall be provided with either direct embedment, base plate or retrofit details as requested in bid documents.
- C. Concrete shall meet the requirements of Section 03300.
- D. Reinforcing:
 - 1. Reinforcing shall meet the requirements of Section 03300.
 - 2. All reinforcing steel shall be designed, detailed, fabricated, and placed in accordance with ACI 301, ACI 318, and CRSI Manual of Standard Practice.

2.8 SHADE FABRIC

- A. Knitted from 100% virgin HDPE with Ultra Violet (U.V.) stabilizers and flame retardant to meet the requirements of NFPA 701, ASTM E-84 and the California State Fire Marshall.
- B. Physical Characteristics: The following indicates minimum physical properties of 100% HDPE membranes.
 - 1. Weight: 10 ounces/sq. yd.
 - 2. Breaking Strength (ASTM D5034):
 - a. Warp 179 lbs.
 - b. Weft 562 lbs.
 - 3. Bursting Strength (ASTM D3787): 475 lbs.
 - 4. UV stability: 10 years.
 - 5. Shade Effect: Angle of Incidence 90% to 97%.
 - 6. Ultraviolet Block: Angle of Incidence 90% to 96%.
- C. Colors: Selected from manufacturer's full range of available colors.
- D. Fabric catenary shall include a low-stretch, braided premium Dyneema HDPE yachting rope or engineered webbing. Steel cables in an edge pocket will not be permitted.
- E. Fabric must be designed to be tensioned off the structural steel frame unless a hip and ridge design is specified.
- F. Tensioning and removing the fabric will be accomplished with an integrated dynamic tensioning system operated with standard hand tools.
- G. Each structure will be provided with a storage bag for the fabric when it is removed by the owner.

PART 3 - PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that project conditions are as indicated on shop drawings.
- B. Installer's Examination:
 - 1. Have installer of this section examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable.
 - 2. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited.
 - 3. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.2 PREPARATION

- A. Ensure that adjacent surfaces, structures, and finishes are protected from damage by construction activities of this section.

3.3 INSTALLATION

- A. Install systems specified in accordance with shop drawings and manufacturer's installation instructions.
- B. Placing of concrete for post bases is specified in Section 03300.

3.4 CLEANING

- A. Remove dust or other foreign matter from component surfaces; clean finishes in accordance with manufacturer's instructions.

3.5 PROTECTION OF INSTALLED PRODUCTS

- A. Ensure that finishes and structure of installed systems are not damaged by subsequent construction activities.
- B. If minor damage to finishes occurs, repair damage in accordance with manufacturer's recommendations; provide replacement components if repaired finishes are unacceptable to Engineer.

END OF SECTION 105300

SECTION 105613 - METAL STORAGE SHELVING

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. Four-post metal storage shelving.

- B. Related Sections:

- 1. Section 114000 "Foodservice Equipment" for metal shelving in kitchen, pantry, and refrigerated spaces.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.

1.4 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 metal storage shelving from single source from single manufacturer.

1.5 PROJECT 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 occupancy levels during the remainder of the construction period.

1.6 COORDINATION

- A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall and ceiling 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating.
- D. Steel Tubing: ASTM A 513, Type 2.
- E. Stainless-Steel Tubing: ASTM A 554, Grade MT-304.
- F. Steel Wire: ASTM A 899.
- G. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
- H. Particleboard: ANSI A208.1, made with binder containing no urea formaldehyde.
- I. Hardboard: ANSI A135.4.

2.2 FOUR-POST METAL STORAGE SHELVING

- A. Open Four-Post Metal Storage Shelving: Factory-formed, field-assembled, freestanding system, designed for shelves to span between and be supported by corner posts, with shelves adjustable over the height of shelving unit. Fabricate initial shelving unit with a post at each corner. Fabricate additional shelving units similarly, so each unit is independent. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories indicated.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Lyon Workspace Products, LLC; 8000 series.
 - b. Penco Products, Inc; Clipper Shelving.
 - c. Republic Storage Systems, LLC; Clip Shelving.
 - 2. Load-Carrying Capacity per Shelf: 350 lb (159 kg).
 - 3. Posts: Fabricated from hot-rolled steel; in manufacturer's standard shape; with perforations at 1-1/2 inches (38 mm) o.c. to receive shelf-to-post connectors.
 - a. Steel Thickness, Nominal: As required for load-carrying capacity per shelf and number of shelves.

- b. Add-On Shelf Posts: Fabricated from hot-rolled steel, manufacturer's standard shape; perforated to match main posts and of same thickness.
 - c. Post Base: Bolt leveler.
 4. Bracing: Manufacturer's standard, single or double diagonal cross bracing at back and ends; as required for stability, load-carrying capacity of shelves, and number of shelves.
 5. Back Panel: One piece fabricated from cold-rolled steel sheet.
 - a. Steel-Sheet Thickness, Nominal: As required for load-carrying capacity per shelf.
 6. End Panels: Fabricated from cold-rolled steel sheet.
 - a. Steel-Sheet Thickness, Nominal: As required for load-carrying capacity per shelf.
 7. Solid-Type Shelves: Fabricated from steel sheet as follows:
 - a. Steel-Sheet Thickness, Nominal: As required for load-carrying capacity per shelf.
 - b. Metallic-Coated Steel-Sheet Thickness, Nominal: As required for load-carrying capacity per shelf.
 - c. Fabricate fronts and backs of shelves with box-formed edges, with corners lapped and welded.
 8. Shelf Quantity: Five shelves per shelving unit in addition to top and bottom shelf.
 9. Shelf-to-Post Connectors: Manufacturer's standard connectors. Shelf pins are not acceptable.
 10. Base: Open, with exposed post legs.
 11. Overall Unit Width: 36 inches.
 12. Overall Unit Depth: 24 inches.
 13. Overall Unit Height: 84 inches (2438 mm).
 14. Accessories:
 - a. Finished End Panels: Fabricated as perforated full-height panels from manufacturer's standard thickness cold-rolled steel sheet and with same finish as posts, with trim for a finished appearance along edges abutting posts and top shelf.
 - b. Shelf Dividers: Fabricated from same material and with same finish as shelves; sliding type.
 15. Finish: Baked enamel.
 - a. Color and Gloss: Standard gray color.

2.3 FABRICATION

- A. Shop Fabrication: Prefabricate shelving components in shop to greatest extent possible to minimize field fabrication; temporarily preassemble shelving components where necessary to ensure that field-assembled components fit together properly. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. Fabricate metal storage shelving 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 work true to line and level with accurate angles and surfaces and straight sharp edges.
 - 2. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
 - 3. Build in straps, plates, brackets, and other reinforcements as needed to support shelf loading.
 - 4. Cut, reinforce, drill, and tap metal fabrications to receive hardware, fasteners, and similar items.
- C. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work. Form backs of shelving units up to 48 inches (1219 mm) wide from one piece.
- D. Form edges and corners free of sharp edges or rough areas. Fold back and crimp exposed edges of unsupported sheet metal to form a 1/2-inch- (13-mm-) wide hem on the concealed side; ease edges of metal plate to radius of approximately 1/32 inch (0.8 mm). Shear and punch metals cleanly and accurately. Remove burrs.
- E. Weld corners and seams continuously to develop strength, minimize distortion, and maintain the corrosion resistance of base metals. At exposed locations, finish welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces before finishing.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 METALLIC-COATED STEEL-SHEET FINISHES

- A. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A 780.
- B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry thickness.

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" or SSPC-SP 8, "Pickling."
- B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry thickness.

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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum finished floor over which metal storage shelving is to be installed.

3.3 INSTALLATION

- A. Install metal storage shelving level, plumb, square, rigid, 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. Install shelves in each shelving unit at spacing indicated on Drawings or, if not indicated, at equal spacing.
 - a. Four-Post Metal Storage Shelving: Install four clips, one at each post, for support of each shelf; with clips fully engaged in post perforations.
- B. Accessories:
 - 1. Install finished end panels and trim at exposed ends of shelving units.
 - 2. Shelf Dividers: Install sliding dividers per shelf.

3.4 ERECTION TOLERANCES

- A. Erect four-post metal storage shelving to a maximum tolerance from vertical of 1/2 inch (13 mm) in up to 10 feet (3 m) of height, not exceeding 1 inch (25 mm) for heights taller than 10 feet (3 m).

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 that has been damaged or has deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 105613

SECTION 107500 - FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes ground-mounted flagpoles made from aluminum.
- B. Owner-Furnished Material: Flags.
- C. Related Sections:
 - 1. Section 265600 "Exterior Lighting" for site lighting fixtures.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:
 - 1. Seismic Loads: according to SEI/ASCE 7.
 - 2. Wind Loads: 90 mph according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles."
 - 3. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

1.4 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 for flagpoles.
- B. Shop Drawings: For flagpoles. Include plans, elevations, details, and attachments to other work. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
 - 1. Include section, and details of foundation system for ground-mounted flagpoles.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

- D. Delegated-Design Submittal: For flagpole 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. Include loads, point reactions, and locations for attachment of flagpoles to building's structure.
- E. Qualification Data: For qualified professional engineer.
- F. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain flagpole as complete unit, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Flagpole; a Kearney-National Inc. company.
 - 2. Atlantic Fiberglass Products, Inc.
 - 3. Baartol Company.
 - 4. Concord Industries, Inc.
 - 5. Eder Flag Manufacturing Company, Inc.
 - 6. Ewing Flagpoles.
 - 7. Lingo Inc.; Acme Flagpole Company Division.
 - 8. Millerbernd Manufacturing Company.
 - 9. Morgan-Francis; Division of Original Tractor Cab Co., Inc.
 - 10. PLP Composite Technologies, Inc.
 - 11. Pole-Tech Company Inc.
 - 12. U.S. 63Flag & Flagpole Supply, LP.
 - 13. USS Manufacturing Inc.

2.2 FLAGPOLES

- A. Flagpole Construction, General: 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.
 3. Provide self-aligning, snug-fitting joints.
- B. Exposed Height: 30 feet (9 m).
- C. Aluminum Flagpoles: Provide cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm).
- D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, not less than 0.064-inch- (1.6-mm-) nominal wall thickness. Provide with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch- (19-mm-) diameter, steel ground spike; and steel centering wedges welded together. Galvanize steel after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.
1. Provide flashing collar of same material and finish as flagpole.
 2. Provide steel ground protectors extending 12 inches (300 mm) aboveground and 6 inches (150 mm) belowground for steel flagpoles where flashing collars are not provided.
- E. Cast-Metal Shoe Base: For anchor-bolt mounting; provide with anchor bolts.
1. Provide units made from aluminum with same finish and color as flagpoles.
 2. Provide ground spike at grade-mounted flagpoles.
 3. Provide connector to building's lightning protection system conductor at roof-mounted flagpoles.

2.3 FITTINGS

- A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
1. 0.063-inch (1.6-mm) spun aluminum, finished to match flagpole.
- B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.
1. Halyard Flag Snaps: Provide two chromium-plated bronze swivel snap hooks per halyard.

2.4 MISCELLANEOUS MATERIALS

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.
- B. Sand: ASTM C 33, fine aggregate.

- C. Elastomeric Joint Sealant: Comply with requirements in Section 079200 "Joint Sealants" for Use NT (nontraffic) and for Use M, G, A, and, as applicable to joint substrates indicated, for Use O.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 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 substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including foundation; accurate placement, pattern, orientation of anchor bolts, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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. Place concrete, as specified in Section 033000 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use nonstaining curing compound.
- E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.3 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.
- B. Ground Set: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure. Install flagpole, plumb, in foundation tube.
 - 1. Foundation Tube: Place tube seated on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION 107500

SECTION 116623 - GYMNASIUM EQUIPMENT

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. Basketball equipment.
 - 2. Volleyball equipment.
 - 3. Safety pads.
 - 4. Electronic Scoreboards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For gymnasium equipment.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each exposed product and for each item and color specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Court layout plans, drawn to scale, and coordinated with floor inserts, game lines, and markers applied to finished flooring.
- B. Product certificates.
- C. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Basketball backstops and anchors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 BASKETBALL EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. AALCO Manufacturing.
 - 2. ADP Lemco.
 - 3. Arizona Courtlines, Inc.
 - 4. Basketball Products International.
 - 5. Bison, Inc.
 - 6. Douglas Industries, Inc.
 - 7. Draper Inc.
 - 8. IPI by Bison.
 - 9. Jaypro Sports, LLC.
 - 10. L. A. Steelcraft Products, Inc.
 - 11. P. W. Athletic Mfg. Co.
 - 12. Performance Sports Systems.
 - 13. Porter Athletic Equipment Company.
 - 14. Schelde North America.
 - 15. Spalding Equipment.
- B. General: Provide equipment complying with requirements in FIBA's "Basketball Rule Book, NCAA's "Men's and Women's Basketball Rules or NFHS's "NFHS Basketball Rules Book."
- C. Provide manufacturer's recommended connections complying with Section 055000 "Metal Fabrications" of size and type required to transfer loads to building structure.
- D. Overhead-Supported Backstops:

1. Folding Type: Provide manufacturer's standard assembly for forward-folding and side-folding, rear-braced backstops, with hardware and fittings to permit folding.
 - a. Location: As indicated on the Drawings.
 2. Finish: Manufacturer's standard polyester powder-coat finish with manufacturer's standard white color.
 3. 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 with detachable crank handle.
- E. Backstop Safety Device: Designed to limit free fall if support cable, chains, pulleys, fittings, winch, or related components fail.
- F. Backstop Electric Operator: Provide operating machine of size and capacity recommended by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.
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. Remote-Control Station(s): NEMA ICS 6, Type 1 enclosure for surface mounting and momentary-contact, three-position, switch-operated control with up, down, and off functions.
 - a. Key Switch: Provide two keys per station.
 3. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop basketball equipment at fully retracted and fully lowered positions.
- G. Basketball Backboards:
1. Shape and Size:
 - a. Rectangular, 72 by 48 inches width by height, with square corners.
 2. Backboard Material: With predrilled holes or preset inserts for mounting goals, and as follows:
 - a. Glass: Not less than 1/2-inch- thick, transparent tempered glass complying with impact testing requirements in 16 CFR 1201 Category II or ANSI Z97.1 Class A for safety glazing.
 - 1) Rim-Restraining Device: Complying with NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.
 3. Target Area and Border Markings: Permanently etched in white color, marked in pattern and stripe width according to referenced rules.

- H. Goal Mounting Assembly: Compatible with goal, backboard, and support framing.
- I. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
 - 1. Single-rim basket ring competition goal.
 - 2. Type: Movable, breakaway design with manufacturer's standard breakaway mechanism and rebound characteristics identical to those of fixed, nonmovable ring.
 - 3. Finish: Manufacturer's standard finish.
- J. 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.
- K. Backboard Safety Pads: Designed for backboard thickness indicated and extending continuously along bottom and up sides of backboard and over goal mounting and backboard supports as required by referenced rules.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.3 VOLLEYBALL EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. ADP Lemco.
 - 2. Douglas Industries, Inc.
 - 3. Draper Inc.
 - 4. Porter Athletic Equipment Company.
- B. General: Provide equipment complying with requirements in FIVB's "Official Volleyball Rules, NCAA's "Women's Volleyball Rules and Interpretations, NFHS's "NFHS Volleyball Rules Book or USAV's "USA Volleyball Rule Book."
- C. Overhead Volleyball System:
 - 1. Overhead volleyball system shall be two independent, welded support frames constructed from steel mechanical tubing. Each main support frame shall have 4-inch OD 11-gauge front steel tubing and formed 1-1/2-inch OD 11-gauge back brace with 1/4-inch x 2-inch HR steel intermediate truss supports. Each support frame shall have stabilizing foot consisting of 3-1/2-inch OD aluminum telescopic inner tube that is lowered and locked into position using internal threaded rod and gear assembly. Stabilizing foot shall be designed to provide superior rigidity and net tension. The bottom inner tube shall be provided with a special spherical shaped, non-marking nylon end pad to protect and minimize contact with floor should post be folded without feet being raised. The main support frame shall pivot on 1-1/4-inch minimum solid steel shaft secured in a milled bearing hole in 1/2-inch minimum steel plate hangers to insure accurate positioning.

2. The folding side braces shall be jackknife type, fully adjustable, self locking in the down position. Support frame, folding braces and overhead superstructure shall have a powder coat finish. Color to be per manufacturer's standard white color.
 3. Volleyball system shall be raised or lowered by a 1/4-inch (6.35 mm) aircraft cable, certified minimum breaking strength of 7,000 pounds (3178 kg), operating over aluminum alloy sheaves with bronze bearings that do not require lubrication.
 - a. Provide manufacturer's standard electrical retraction system.
 4. Each support frame shall have a telescoping net attachment post to allow infinite height adjustment from 6 feet (1.854 m) to 8'4" (2.540 m) to meet all age group height settings from elementary school use to international competition for both men and women. Posts shall incorporate an internal threaded rod mechanism for easy, precise and infinite height adjustments. Telescopic net attachment post shall have a clear anodized finish and be constructed of a 3-1/2-inch O.D. (8.890 cm) schedule 80 outer aluminum tube, with a wall thickness of 0.300-inch (0.7620 cm). The inner telescoping adjustable tube shall be 2-7/8-inch O.D. (7.303 cm) schedule 80 aluminum tube, with a wall thickness of 0.300-inch (0.7620 cm).
 5. One net attachment post shall incorporate a heavy-duty, self locking worm gear mechanism (net winch). Net winch shall be furnished with a heavy 2-inch (5 cm) wide high tensile nylon strap with heavy-duty snap hook to eliminate the possibility of hook breaking and guarantee safe connection to net top cable. The winch shall be furnished with a folding handle for player safety.
- D. Net: 32 feet long; manufacturer's standard net compatible with the overhead volleyball system, and as follows:
1. Width and Mesh: Competition volleyball net, 39 inches with 4-inch- square mesh made of black nylon string.
 2. Net-Tensioning System: Manufacturer's standard.
- E. Judges' Stands: Provide manufacturer's standard integral Judges Stand that is attached directly to the main support frame. Judges Stand shall be constructed of 1-1/2-inch by 1-1/2-inch, 14-gauge square steel tubing and 1-inch OD steel tubing, welded together. Legs, steps, platform, and handrails shall all be one solid unit. Judges platform shall consist of 1/2-inch thick, polyurethane finished Birch plywood, permanently bolted to stand. Handrail/ladder section shall be spaced vertically 16 inches on center with ladder steps spaced horizontally of 16-inch centers. Judges stand shall be supplied complete with safety padding for player protection.
- F. Safety Pads: Comply with NCAA and NFHS requirements. Post sets shall include wrap around pads hinged at corners to fold neatly around material to be padded. Two pads shall be designed to wrap the main support frame to a height of 6' 0" above the playing surface. Upright pads to also wrap around the net attachment post sections including the tensioning winch.
1. Fabric Cover Flame-Resistance Ratings: Complies with NFPA 701.
 2. Fabric Color: As selected by Architect from full range of industry standard colors and color densities.

2.4 SAFETY PADS (WALL PADDING)

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. AALCO Manufacturing.
 2. ADP Lemco.
 3. American Athletic, Inc.
 4. Draper Inc.
 5. IPI by Bison.
 6. Jaypro Sports, LLC.
 7. Performance Sports Systems.
 8. Porter Athletic Equipment Company.
 9. Arizona Courtlines, Inc.
- 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 that is fabricated from puncture- and tear-resistant, PVC-coated polyester or nylon-reinforced PVC fabric, not less than 14-oz./sq. yd and 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: Manufacturer's standard.
 3. Size: Each panel section, 24 inches wide by not less than 72 inches long.
 4. Number of Modular Panel Sections: As indicated.
 5. Installation Method: Manufacturer's standard.
 6. Fabric Covering Color(s): As selected by Architect from manufacturer's full range.

2.5 SCOREBOARDS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Daktronics; Model BB-2103 or comparable product by the following:
1. Fairplay.
 2. Nevco.
 3. Translux.
- B. Characteristics:
1. Size: Nominal 6 feet tall by 8 feet wide.
 2. Scoring for basketball, volleyball and wrestling.

3. LED lighting.
 4. Horn.
 5. Location: Two total as indicated on the Drawings.
 6. Border striping.
 7. Wireless Control Console:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide Daktronics; All-Sport 5000 control console with carrying case or comparable product by one of the following:
 - 1) Fairplay.
 - 2) Nevco.
 - 3) Translux.
 - b. Quantity: Two total.
 - c. Provide (2) one total 2.4 ghz radio transmitter capable of operating on different frequencies to allow for independent or combined use on the scoreboard.
- C. Provide 5-year warranty on parts coverage on scoreboard and wireless component.

2.6 MISCELLANEOUS

- A. Lockable Steel Cages: For storing volleyballs and basketballs, as indicated on drawings.
- B. Roller Racks for Balls: As indicated on drawings.

2.7 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for use and finish type 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/A 500M or ASTM A 513, cold formed.
 3. Steel Sheet: ASTM A 1011/A 1011M.
- C. Support Cable: Manufacturer's standard galvanized-stranded-steel wire rope. Provide fittings complying with wire rope manufacturer's written instructions for size, number, and installation method.
- D. Support Chain and Fittings: For chains used for overhead lifting, provide Grade 80 heat-treated alloy steel chains, complying with ASTM A 391/A 391M, with commercial-quality, hot-dip galvanized or zinc-plated steel connectors and hangars.
- E. General-Purpose Chain: For chains not used for overhead lifting, provide carbon steel chain, complying with ASTM A 413/A 413M, Grade 30 proof coil chain or other grade recommended

by gymnasium equipment manufacturer. Provide coating type, chain size, number, and installation method complying with manufacturer's written instructions.

- F. Castings and Hangers: Malleable iron, complying with ASTM A 47/A 47M; grade required for structural loading.
- G. Softwood Plywood: DOC PS 1, exterior.
- H. Particleboard: ANSI A208.1.
- I. Equipment Wall-Mounted Board: Manufacturer's standard.
- J. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed.
- K. Grout: ASTM C 1107/C 1107M with minimum strength recommended in writing by gymnasium equipment manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- 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. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.
- C. Connections: Connect electric operators to building electrical system.
- D. 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 is approved by Owner, and store units in location indicated on Drawings.
- E. 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.

3.2 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.

3.3 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION 116623

SECTION 116653 - GYMNASIUM DIVIDERS

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 gymnasium divider curtains.
- B. Related Sections include the following:
 - 1. Division 26 Sections for electrical service for motor operators, controls, and other powered devices for motorized gymnasium dividers.

1.3 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: Include plans, elevations, sections, details, and attachments to other work.
- C. 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 dividers to structure.
- D. Samples for Verification: For divider curtain fabric, not less than 12 inches square of open mesh, and of opaque fabric.
- E. Product Certificates: For each type of gymnasium divider, signed by product manufacturer.
- F. Qualification Data: For Installer.
- G. Operation and Maintenance Data: For gymnasium dividers to include in emergency, operation, and maintenance manuals.
- H. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Source Limitations: Obtain each type of gymnasium divider from a single manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install gymnasium dividers 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 for gymnasium dividers.

1.6 COORDINATION

- A. Coordinate installation of overhead-supported gymnasium dividers and suspension system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of gymnasium dividers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, faulty operation of gymnasium dividers.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 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: Manufacturer's standard 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, hot-dip galvanized steel connectors and hangars.
- E. Castings and Hangers: Malleable iron, ASTM A 47/A 47M, grade required for structural loading.
- F. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed.

2.2 DIVIDER CURTAINS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
1. AALCO Manufacturing.
 2. American Athletic, Inc.
 3. Arizona Courtlines, Inc.
 4. Basketball Products International; a division of American Athletic, Inc.
 5. Douglas Industries, Inc.
 6. Draper Inc.
 7. Institutional Products Inc.
 8. Jaypro Sports, LLC.
 9. Performance Sports Systems.
 10. P. W. Athletic Mfg. Co.
 11. ADP Lemco.
- B. Divider Curtains: Electrically operated, roll up, and as follows:
1. Upper Curtain, Mesh: Woven fabric of 100 percent polyester yarn coated with PVC weighing not less than 6.5 oz./sq. yd.
 - a. Mesh Color: As selected by the Architect from manufacturer's full range of colors.
 2. Lower Curtain, Solid: Woven polyester coated with PVC, 18 oz./sq. yd, embossed, 8-foot (2.4-m) height above floor.
 - a. Fabric Color: As selected by the Architect from manufacturer's full range of colors.
 3. Divider Curtain Flame-Resistance Ratings: Passes NFPA 701, inherently and permanently flame resistant.

- 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 will require retreatment after designated time period or cleaning.
- C. Curtain Fabrication: Fused seams and the following:
1. Top Hem: Reinforce with double thickness mesh for grommets.
 2. Bottom Hem for Roll-up Curtains: Floor-length curtains with hems 2 inches above finished floor and with manufacturer's standard 3-1/2- to 4-inch- roll-up tube and lifting tape.
- D. Accessories:
1. Grommets: Manufacturer's standard size and spacing, for snaps or S-hooks.
 2. Curtain Battens: Fabricate battens from steel pipe with a minimum number of joints. As necessary for required lengths, connect pipe with drive-fit pipe sleeve not less than 18 inches long, and secure with 4 flush rivets, plug welds, threaded couplings, or another equally secure method. Shop-paint completed pipe battens with black paint.
 - a. Steel Pipe: ASTM A 53/ A 53M, Grade A, standard weight (Schedule 40), black, 1-1/2-inch nominal diameter, unless otherwise indicated.
- E. Divider Curtain Operator: Roll-up drive tube.
- F. Divider Curtain Electric Operator: Provide operating machine of size and capacity recommended by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.
1. Operator Type: Electric motor, enclosed gear-head-reduction drive, with chain and sprocket secondary drive.
 2. Motor Characteristics: Sufficient to start, accelerate, reverse, and operate connected loads at designated speeds within installed environment and with indicated operating sequence, and without exceeding nameplate rating or considering service factor. Comply with NEMA MG 1, and the following:
 3. Voltage: 120 V.
 4. Horsepower: 3/4 hp.
 5. Enclosure: Manufacturer's standard.
 6. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.
 7. Service Factor: 1.15 for open dripproof motors; 1.0 for totally enclosed motors.
 8. Phase: One.
 9. Remote-Control Station(s): NEMA ICS 6, Type 1 enclosure for recessed or flush mounting, momentary-contact, three-position switch-operated control.
 - a. Keys: Provide two key(s) per station.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for 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.
 - 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. Complete field assembly, where required.
- B. Unless otherwise indicated, install gymnasium dividers after other finishing operations, including painting, have been completed.
- C. Gymnasium Dividers 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. Verify clearances for movable components of gymnasium dividers 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 gymnasium dividers to structural support and for properly transferring load to in-place construction.
- E. Connections: Connect automatic operators to building electrical system.

3.3 ADJUSTING

- A. Adjust movable components of gymnasium dividers 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 divider installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

- B. Replace gymnasium divider components 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 dividers. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 116653

SECTION 116800 - PLAY FIELD EQUIPMENT AND STRUCTURES

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 playground equipment as follows:
 - 1. Freestanding indoor playground equipment.

1.3 DEFINITIONS

- A. Definitions in ASTM F1487 apply to Work of this Section.
- B. IPEMA: International Play Equipment Manufacturers Association.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Indoor slide.
- B. Shop Drawings: For each type of playground equipment.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include fall heights and use zones for playground equipment, coordinated with the critical-height values of protective surfacing specified in Section 321816.13 "Playground Protective Surfacing."
- C. Samples for Initial Selection: For each type of exposed finish.
 - 1. Manufacturer's color charts.
 - 2. Include Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish on the following products:

1. Include Samples of accessories to verify color and finish selection.
2. Posts and Rails: Minimum 6 inches (150 mm) long.
3. Platforms: Minimum 6 inches (150 mm) square.
4. Molded Plastic: Minimum 3 inches (76 mm) square.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of playground equipment.
- C. Sample Warranty: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For playground equipment and finishes to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain playground equipment from single source from single manufacturer.
- B. Playground equipment and components shall have the IPEMA Certification Seal.

- C. The following playground equipment and components shall have the IPEMA Certification Seal:
1. Indoor Slide.

2.2 PERFORMANCE REQUIREMENTS

- A. Safety Standard: Provide playground equipment according to ASTM F1487.

2.3 FREESTANDING PLAYGROUND EQUIPMENT

- A. Slide: Single Spiral Slide.

1. Manufacturer: Provide a slide by one of the following Manufacturers:
 - a. BCI Burke Company, LLC
 - b. Columbia Cascade Company
 - c. Landscape Structures Inc.
 - d. Recreation Creations, Inc.
 - e. Soft Play, LLC.
2. Plan Configuration: Full-turn spiral chute.
3. Access: Second level tube entrance access.
4. Sit-Down Entrance: With [protective barriers] [opaque plastic panel barriers] and overhead handhold and side handholds.
5. Frame: Manufacturer's standard [galvanized-steel pipe or tubing] [aluminum pipe or tubing].
6. Height: 15'-0" from second level entrance to first level.
7. Sliding Surface: Inclined
8. Sliding Surface Construction: Plastic tube, ID not less than 30 inches (760 mm)
9. Colors: As selected by Architect from manufacturer's full range.
10. Age Appropriateness: Five through 12 years.

2.4 FABRICATION

- A. Provide sizes, strengths, thicknesses, wall thickness, and weights of components as required to comply with requirements in ASTM F1487. Factory drill components for field assembly. Unnecessary holes in components, not required for field assembly, are not permitted. Provide complete play structures, including supporting members and connections, means of access and egress, designated play surfaces, barriers, guardrails, handrails, handholds, and other components indicated or required for equipment indicated.
- B. Metal Frame: Fabricate main-frame upright support posts from metal pipe or tubing with cross-section profile and dimensions as required. Unless otherwise indicated, provide each pipe or tubing main-frame member with manufacturer's standard drainable bottom plate or support flange. Fabricate secondary frame members, bracing, and connections from either steel or aluminum.

- C. Play Surfaces: Manufacturer's standard elevated drainable decks, platforms, landings, walkways, ramps, and similar transitional play surfaces, designed to withstand loads; fabricated from molded plastic made into floor units with slip-resistant finish. Fabricate units in modular sizes and shapes to form assembled play surfaces indicated.
- D. Protective Barriers: Fabricate according to ASTM F1487. Extend barriers to height above the protected elevated surface according to requirements for use by age group indicated. Fabricate from the following:
 - 1. Opaque plastic panels.
- E. Guardrails: Provide guardrails configured to completely surround the protected area, except for access openings. Fabricate from metal pipe or tubing. Extend guardrails according to requirements for use by age group indicated.

2.5 MATERIALS

- A. Aluminum: Material, alloy, and temper recommended by manufacturer for type of use and finish indicated.
- B. Steel: Material types, alloys, and forms recommended by manufacturer for type of use and finish indicated.
- C. Stainless-Steel Sheet: Type 304; finished on exposed faces with No. 2B finish.
- D. Opaque Plastics: Color impregnated, UV stabilized, and mold resistant.
- E. Post Caps: Cast aluminum or color-impregnated, UV-stabilized, mold-resistant polyethylene or polypropylene, color to match posts.
- F. Platform Clamps and Hangers: Cast aluminum or zinc-plated steel, not less than 0.105-inch- (2.7-mm-) nominal thickness.
- G. Hardware: Manufacturer's standard; commercial-quality; corrosion-resistant; hot-dip galvanized steel and iron, stainless steel, or aluminum; of a vandal-resistant design.
- H. Fasteners: Manufacturer's standard; corrosion-resistant; hot-dip galvanized or zinc-plated steel and iron, or stainless steel; permanently capped; and theft resistant.

2.6 CAST-IN-PLACE CONCRETE

- A. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with minimum 28-day compressive strength of 3000 psi (20.7 MPa), 3-inch (76-mm) slump, and 1-inch- (25-mm-) maximum-size aggregate.

2.7 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
- B. PVC Finish: UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on PVC finish, with flame retardant added, and with minimum dry film thickness of 80 mils (2 mm). Comply with coating manufacturer's written instructions for pretreatment and application.

2.8 IRON AND STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm). Comply with coating manufacturer's written instructions for pretreatment, applying, and baking.
- B. PVC Finish: UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on PVC finish, with flame retardant added, and with minimum dry film thickness of 80 mils (2 mm). Comply with coating manufacturer's written instructions for pretreatment and application.

2.9 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for earthwork, subgrade elevations, surface and subgrade drainage, and other conditions affecting performance of the Work.
 - 1. Do not begin installation before final grading required for placing playground equipment and protective surfacing is completed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions for each equipment type unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.

1. Maximum Equipment Height: Coordinate installed fall heights of equipment with finished elevations and critical-height values of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
 1. Perform inspection and testing for each type of installed playground equipment according to ASTM F1487
- B. Playground equipment item will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Notify Owner 48 hours in advance of date(s) and time(s) of testing and inspection.

END OF SECTION 116800

SECTION 117400 – EVACUATION CHAIR AND METAL STORAGE CABINET

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. Recessed metal storage cabinet for the following:
 - a. Evacuation chair.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show chair type, door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For recessed metal storage cabinet. Include plans, elevations, sections, details, and attachments to other work.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For evacuation chair to include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate size of metal storage cabinet to ensure that type and size of evacuation chair indicated are accommodated.
- B. Coordinate sizes and locations of cabinet with wall depths.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace evacuation chair that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Life-time warranty from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EVACUATION CHAIR AND CABINET

- A. Evacuation Chair and Cabinet Type: Cabinet suitable for evacuation stair with identifying logo on door.
 - 1. Products: Subject to compliance with requirements, provide the following or pre-approved equal:
 - a. EVAC+CHAIR North America, LLC; Model 300-H.
- B. Chair Capacity: 400 lbs weight capacity.
- C. Recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
- D. Cabinet Construction: Commercial, nonrated.
- E. Cabinet Material: 20-gauge galvanized steel cabinet.
- F. Cabinet Size: 44 inches in height by 24 inches in depth by 12 inches in depth.
- G. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style and door material and style indicated.
 - 1. Locks: Provide manufacturer's standard locking handle.
- H. Finish:
 - 1. Baked enamel or powder coat.
 - a. Color: As selected by Architect from manufacturer's full range of industry colors.

2.2 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of metal storage cabinet from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish metal storage cabinet after assembly.
- D. 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 walls and partitions for suitable framing depth and blocking where recessed cabinet will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recess for recessed cabinet as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install cabinet in location and at mounting height indicated.
 - 1. Cabinet: 54 inches (1372 mm) above finished floor to top of cabinet.
- B. Cabinet: Fasten cabinet to structure, square and plumb.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as cabinet is installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust cabinet door to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes or replace cabinet that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by cabinet manufacturers.
- E. Replace cabinet that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104416

SECTION 122413 - ROLLER WINDOW SHADES

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. Manually-operated roller shades with single rollers.
 - 2. Motor-operated roller shades with single rollers.

- B. Related Requirements:

- 1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
 - 2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 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, 10 inches (250 mm) long.

- D. Samples for Initial Selection: For each type and color of shadeband material.

- 1. Include Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roller shades to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

1.8 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.

1.9 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Draper Inc.
 - 2. Hunter Douglas Contract.
 - 3. MechoShade Systems, Inc.
- B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY-OPERATED SHADES WITH SINGLE-ROLLERS

- 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. Bead Chains: Manufacturer's standard.
 - 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.
2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.
 - a. Provide for shadebands that weigh more than 10 lb (4.5 kg) or for shades as recommended by manufacturer, whichever criterion is 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. Direction of Shadeband Roll: Regular, from back of roller.
 2. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- C. Mounting Hardware: 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 that are operated by one roller drive-end assembly.
- E. Shadebands:
 1. Shadeband Material: Light-filtering fabric.
 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
 - b. Color and Finish: As selected by Architect from manufacturer's full range.

2.3 MOTOR-OPERATED, SINGLE-ROLLER SHADES

- 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. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Electric Motor: Manufacturer's standard tubular, 120-volt, enclosed in roller.
 3. Limit Switch: Adjustable switch interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
 4. Operating Features:

- a. One switch to control all shades.
 - b. Capable of accepting input from building automation control system.
 - c. Override switch.
- 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. Direction of Shadeband Roll: Regular, from back of roller.
 2. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- C. Mounting Hardware: 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 that are operated by one roller drive-end assembly.
- E. Shadebands:
1. Shadeband Material: Light-filtering fabric.
 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
 - b. Color and Finish: As selected by Architect from manufacturer's full range.

2.4 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
1. Source: Roller-shade manufacturer.
 2. Type: PVC-coated fiberglass.
 3. Weave: Mesh.
 4. Orientation on Shadeband: Up the bolt.
 5. Openness Factor: 1 percent.
 6. Color: As selected by Architect from manufacturer's full range.
 7. Location: As indicated on the Drawings.

2.5 ACCESSORIES

- A. Roller Shade Pocket: For recessed mounting in acoustical tile, or drywall ceilings as indicated on the Drawings.
1. Provide either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.

- a. Provide "Vented Pocket" such that there will be a minimum of four 1 inch (25.4 mm) diameter holes per foot allowing the solar gain to flow above the ceiling line.
- B. Fascia: For mounting in areas with no ceiling indicated (where ceiling is exposed to structure above), as indicated on the Drawings.
 1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
 2. Fascia shall be able to be installed across two or more shade bands in one piece.
 3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
 4. Provide bracket/fascia end caps where mounting conditions expose outside of roller shade brackets.
 5. Notching of fascia for manual chain shall not be acceptable.

2.6 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 (23 deg C):
 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4-inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4-inch (6 mm), plus or minus 1/8 inch (3.1 mm).
 2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- 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.
 - 1. Opaque Shadebands: Located so shadeband is not closer than 2 inches (51 mm) to interior face of glass. Allow clearances for window operation hardware.
- 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.

3.6 ROLLER SHADE SCHEDULE

- A. Locate manually- and motorized-operated roller shades in glazed openings indicated.
 - 1. Refer to Reflected Ceiling Plans for locations of all roller shades.

END OF SECTION 122413

SECTION 123216 - MANUFACTURED PLASTIC-LAMINATE-CLAD CASEWORK

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 plastic-laminate-clad cabinets of stock design.
- B. Related Requirements:
 - 1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring casework.
 - 2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring casework.
 - 3. Section 096513 "Resilient Base and Accessories" for resilient base applied to plastic-laminate-clad casework.
 - 4. Section 123623.13 "Plastic-Laminate-Clad Countertops."

1.3 DEFINITIONS

- A. Definitions in the AWI/AWMAC/WI's "Architectural Woodwork Standards" apply to the Work of this Section.

1.4 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.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For plastic-laminate-clad casework.
 - 1. Include plans, elevations, sections, and attachments to other work including blocking and reinforcements required for installation.
 - 2. Indicate types and sizes of casework.
 - 3. Indicate manufacturer's catalog numbers for casework.
 - 4. Show fabrication details, including types and locations of hardware.

5. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and equipment.
 - C. Keying Schedule: Include schematic keying diagram and index each key set to unique designations that are coordinated with the Contract Documents.
 - D. Samples: For casework and hardware finishes.
 - E. Samples for Initial Selection: For casework and hardware finishes.
- 1.6 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer.
 - B. Sample Warranty: For special warranty.
- 1.7 QUALITY ASSURANCE
- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.
- 1.9 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 levels planned for building occupants during remainder of construction period. Maintain temperature and relative humidity during remainder of construction period in range recommended for Project location by the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.
 - C. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.
 - D. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of 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.
 - 2. Warranty Period: Five 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. Case Systems Inc.
 - 2. FADCO, Inc.
 - 3. Stevens Industries, Inc.
 - 4. TMI Systems Design Corporation.
 - 5. RSS Millwork.
- B. Source Limitations: Obtain plastic-laminate-clad casework from single source from single manufacturer.

2.2 CASEWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the AWI/AWMAC/WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.
 - 1. Grade: Custom.
 - 2. Provide inspections of casework fabrication and installation together with labels and certificates from AWI certification program indicating that casework complies with requirements of grades specified.
- B. Product Designations: Drawings indicate sizes, configurations, and finish materials of manufactured plastic-laminate-clad casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes and door and drawer configurations, of same finish materials, and complying with the Specifications may be considered. See Section 016000 "Product Requirements."
- C. Product Designations: Drawings indicate configurations of manufactured plastic-laminate-clad casework by referencing designations of Casework Design Series numbering system in Appendix A of the AWI/AWMAC/WI's "Architectural Woodwork Standards."

2.3 PLASTIC-LAMINATED-FACED CABINETS

A. Design:

1. Flush overlay.

B. Grain Direction for Wood-Grain Plastic Laminate:

1. Doors: Vertical with continuous vertical matching.
2. Drawer Fronts: Vertical.
3. Face Frame Members: Lengthwise.
4. End Panels: Vertical.
5. Bottoms and Tops of Units: Side to side.
6. Knee Space Panels: Vertical.
7. Aprons: Vertical.

C. Exposed Materials:

1. Plastic-Laminate Grade: HGS.
2. Edge banding: PVC
3. Provide plastic laminate for semi-exposed surfaces unless otherwise indicated.
 - a. Provide plastic laminate of same grade as exposed surfaces for interior faces of cabinets and wall cabinets that have no doors or drawers and other locations where opposite side of component is exposed.
 - b. Grade: VGS.
4. Thermoset Decorative Overlay (Melamine): Provide thermoset decorative overlay for surfaces at cabinet interiors (where interior is fully concealed by door or drawer), unless otherwise indicated.
 - a. Color: White.
5. Hardboard: Use only for cabinet backs where exterior side of back is not exposed.
6. Unless otherwise indicated, provide specified edge banding on all semi-exposed edges.

D. Concealed Materials:

1. Solid Wood: With no defects affecting strength or utility.
2. Plywood: Hardwood plywood.
3. Plastic Laminate: Grade BKL.
4. Particleboard.
5. MDF.
6. Hardboard.

2.4 MATERIALS

- A. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
- B. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated.
- C. Softwood Plywood: DOC PS 1.

- D. Particleboard: ANSI A208.1, Grade M-2.
- E. MDF: Medium-density fiberboard, ANSI A208.2.
- F. Hardboard: ANSI A135.4, Class 1 tempered.
- G. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.
- H. PVC Edge banding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 0.12 inch (3 mm) thick at doors and drawer fronts, 0.04 inch (1 mm) thick elsewhere.
- I. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.
 - 1. Edge banding for Thermoset Decorative Panels: PVC or polyester edge banding matching thermoset decorative panels.

2.5 DESIGN, COLOR, AND FINISH

- A. Thermoset Decorative Panel Colors, Patterns, and Finishes: As selected by Architect from casework manufacturer's full range.
- B. Plastic-Laminate Colors, Patterns, and Finishes: As indicated by manufacturer's designations.
 - 1. Manufacturer: Nevamar.
 - a. Color:
 - 1) PL1: WM8340T Clear Maple, Textured.
 - a) At all Science classrooms, plastic laminate to receive manufacturer's standard chemical-resistant finish.
 - 2. Manufacturer: Formica.
 - a. Color:
 - 1) PL2: 8824-58 White Drops, Matte.
 - a) At all Science classrooms, plastic laminate to receive manufacturer's standard chemical-resistant finish.
 - 3. Manufacturer: Wilsonart, SOLICOR™.
 - a. Color:
 - 1) PL3: SOLICOR™ D354 Designer White, High Gloss.
- C. PVC Edge Banding Color: As selected from casework manufacturer's full range.

2.6 FABRICATION

- A. Plastic-Laminate-Clad Cabinet Construction: As required by referenced quality standard, but not less than the following:
1. Bottoms and Ends of Cabinets, and Tops of Wall Cabinets and Tall Cabinets: 3/4-inch (19-mm) particleboard.
 2. Shelves: 3/4-inch- (19-mm-) thick particleboard.
 3. Backs of Casework: 1/2-inch- (13-mm-) thick particleboard or MDF where exposed, 1/4-inch- (6.4-mm-) thick hardboard dadoed into sides, bottoms, and tops where not exposed.
 4. Drawer Fronts: 3/4-inch (19-mm) particleboard.
 5. Drawer Sides and Backs: 1/2-inch- (13-mm-) thick solid-wood or veneer-core hardwood plywood, with glued dovetail or multiple-dowel joints.
 6. Drawer Bottoms: 1/4-inch- (6.4-mm-) thick hardwood plywood glued and dadoed into front, back, and sides of drawers. Use 1/2-inch (13-mm) material for drawers more than 24 inches (600 mm) wide.
 7. Doors: 3/4 inch (19 mm) thick, with particleboard or MDF cores.
- B. Filler Strips: Provide as needed to close spaces between casework and walls, ceilings, and equipment. Fabricate from same material and with same finish as casework.

2.7 CASEWORK HARDWARE

- 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: Chrome-plated, semi-concealed, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two hinges for doors less than 48 inches (1220 mm) high and provide three hinges for doors more than 48 inches (1220 mm) high.
- C. Wire Pulls: Solid chrome-plated brass wire pulls, fastened from back with two screws.
1. Provide two pulls for drawers more than 24 inches (600 mm) wide.
- D. Door Catches: Zinc-plated, nylon-roller spring catch. Provide two catches on doors more than 48 inches (1220 mm) high.
- E. Drawer Slides: BHMA A156.9, Type B05091.
1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated, steel ball-bearing slides.
- F. Drawer and Hinged-Door Locks: Mortise type, five-pin tumbler, brass with chrome-plated finish, and complying with BHMA A156.11, Grade 1.
1. Provide a minimum of two keys per lock and six master keys.

2. Provide locks where indicated on casework elevations.

- G. Sliding-Door Hardware Sets: Manufacturer's standard, to suit type and size of sliding-door unit.
- H. Adjustable Shelf Supports: Single-pin metal shelf rests complying with BHMA A156.9, Type B04013.

2.8 ACCESSORIES

- A. Fire-Rated Chemical and Flammable Liquid Storage Cabinet: Wood cabinets to meet NFPA and OSHA standards and as follows:
 - 1. Flammable Liquid Safety Cabinet: Basis of Design: Flinn/SciMatCo Acid Cabinet SE7131 54-gallon wood flammable liquid storage cabinet. Exterior dimensions of 43-inches W by 18-inches D by 44-3/4-inches H with two adjustable shelves and interlocking wooden door assembly.
 - a. Color: Yellow.
 - b. Location: Locate at all Science Classrooms. Coordinate exact location with Owner.

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 the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CASEWORK INSTALLATION

- A. Grade: Install casework to comply with same quality standard grade as item to be installed.
- B. Install casework level, plumb, and true in line; shim as required using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- C. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch (1.5 mm) of a single plane. Align similar adjoining doors and drawers to a tolerance of 1/16 inch (1.5 mm). Bolt adjacent cabinets together with joints flush, tight, and uniform.
- D. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch (1.5 mm) of a single plane. Fasten cabinets to hanging strips, masonry, framing, wood blocking, or reinforcements in walls and partitions. Align similar adjoining doors to a tolerance of 1/16 inch (1.5 mm).

- E. Fasten casework to adjacent units and to masonry, framing, wood blocking, or reinforcements in walls and partitions to comply with the AWI/AWMAC/WI's "Architectural Woodwork Standards."
- F. 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.
- G. Adjust operating hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 CLEANING

- 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.

END OF SECTION 123216

SECTION 123623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

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 plastic-laminate-clad countertops.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For plastic-laminate-clad countertops.
 - 1. Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.
 - 2. Show locations and sizes of cutouts and holes for items installed in plastic-laminate-clad countertops.
 - 3. Apply AWI Quality Certification Program label to Shop Drawings.
- C. Samples: Plastic laminates in each type, color, pattern, and surface finish required in manufacturer's standard size.
- D. Samples for Initial Selection: For plastic laminates.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program.

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: AWI's Quality Certification Program accredited participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver countertops only after casework and supports on which they will be installed have been completed in installation areas.
- B. Store countertops in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
- C. Keep surfaces of countertops covered with protective covering during handling and installation.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet-work 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.
- B. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.
- C. Field Measurements: Where countertops 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.
- D. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.
 - 1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Grade: Premium.
- C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
- D. Chemical-Resistant, High-Pressure Decorative Laminate: NEMA LD 3, Grade HGP, and as follows:

1. Locations: At all Science classrooms, and as indicated on the Drawings.
2. Laminate has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.9.5:
 - a. Nitric Acid (30 Percent): Moderate effect.
 - b. Sulfuric Acid (77 Percent): Moderate effect.
 - c. Hydrochloric Acid (37 Percent): Moderate effect.
 - d. Phosphoric Acid (75 Percent): No effect.
 - e. Acetic Acid (98 Percent): No effect.
 - f. Formaldehyde: No effect.
 - g. Ethyl Acetate: No effect.
 - h. Ethyl Ether: No effect.
 - i. Phenol (85 Percent): Moderate effect.
 - j. Benzene: No effect.
 - k. Xylene: No effect.
 - l. Butyl Alcohol: No effect.
 - m. Furfural: No effect.
 - n. Methyl Ethyl Ketone: No effect.
 - o. Sodium Hydroxide (25 Percent): No effect.
 - p. Sodium Sulfide (15 Percent): No effect.
 - q. Ammonium Hydroxide (28 Percent): No effect.
 - r. Zinc Chloride: No effect.
 - s. Gentian Violet: No effect.
 - t. Methyl Red: No effect.

E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Refer to Section 123216 Manufactured Plastic Laminate Clad Casework for finishes.

F. Edge Treatment: Provide high pressure plastic laminate to match horizontal surface color.

G. Core Material: Particleboard made with exterior glue exterior-grade plywood.

H. Core Material at Sinks: Particleboard made with exterior glue or exterior-grade plywood.

I. Core Thickness: 3/4 inch (19 mm).

1. Build up countertop thickness to 1-1/2 inches (38 mm) at front, back, and ends with additional layers of core material laminated to top.

J. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

K. Paper Backing: Provide paper backing on underside of countertop substrate.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of countertop and quality grade specified unless otherwise indicated.

1. Softwood Plywood: DOC PS 1.

2.3 ACCESSORIES

A. Wire-Management Grommets:

1. Circular, molded-plastic grommets and matching plastic caps with slot for wire passage.

a. Product: Subject to compliance with requirements, provide the following:

1) Doug Mockett & Company, TG Flip-Top® Series.

b. Size: 2-3/8-inch overall diameter, to fit 2-inch hole.

c. Color: To be selected by Architect from manufacturer's full range.

2. Rectangular flip-up power grommets per Division 26 Specifications.

a. Color: Stainless steel.

B. Cantilever Bracket Support:

1. Fully Exposed Support Brackets:

a. Product: Subject to compliance with requirements, provide the following:

1) Rakks®, EH-1818.

b. Color: Primed to receive paint. Paint to match walls unless noted otherwise on Drawings.

2. In-Wall Flush Mount Support Brackets:

a. Product: Subject to compliance with requirements, provide the following:

1) Rakks®, EH-1209FM.

b. Color: Clear anodized.

2.4 MISCELLANEOUS MATERIALS

A. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch (25 mm) over base cabinets. Ease edges to radius indicated for the following:
 - 1. Solid-Wood (Lumber) Members: 1/16 inch (1.5 mm) unless otherwise indicated.
- C. 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 countertop fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended, and check measurements of assemblies against field measurements before disassembling for shipment.
- D. Shop cut openings to maximum extent possible to receive 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 cutouts by saturating with varnish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.
- B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.2 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 - 1. Provide cutouts for 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.
2. Seal edges of cutouts by saturating with varnish.
- C. 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 countertops with concealed clamping devices located within 6 inches (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Countertop Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8-inch-in-96-inches (3-mm-in-2400-mm) variation from a straight, level plane.
 2. Secure backsplashes to walls with adhesive.
 3. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects. Where not possible to repair, replace countertops. Adjust joinery for uniform appearance.
- B. Clean countertops on exposed and semiexposed surfaces.
- C. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches (1220 mm) o.c. Remove protection at Substantial Completion.

END OF SECTION 123623.13

SECTION 123661.16 - SOLID SURFACING WINDOW SILLS

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. Solid surface window sills.

1.3 ACTION SUBMITTALS

- A. Product Data: For window sill materials.
- B. Shop Drawings: For window sills. Show materials, finishes, profiles and methods of joining.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- C. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches (150 mm) square.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material window sills 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.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate window sills similar to that required for this Project, and whose products have a record of successful in-service performance.

- B. Installer Qualifications: Fabricator of window sills.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of window sills by field measurements.

PART 2 - PRODUCTS

2.1 SOLID SURFACE WINDOW SILL MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. LG Hausys, Hi-Macs®.
 - 1) Colors and Patterns: As indicated by manufacturer's designations.
 - a) SSM1: G108 Lunar Sand.

2.2 WINDOW SILL FABRICATION

- A. Solid surface material sills.
 - 1. Sills: 1/2-inch- (19-mm-) thick, solid surface material.
 - 2. Fabrication: Fabricate tops in one piece with shop-applied edges unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

2.3 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 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.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Secure window sills to subtops 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.
- B. Install sills level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m).
 - 1. Adhere solid surface sills to substrates with adhesive as approved by manufacturer.
- C. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

SECTION 126600 - TELESCOPING STANDS

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. Wall-attached telescoping stands.
- B. Related Requirements:
 - 1. Division 26 and 27 sections for electrical power and communication systems installed in telescoping stands.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance Characteristics: Engineer, fabricate, and install telescoping stands to withstand the design loads specified in NFPA 102, "Standard for Assembly Seating, Tents, and Membrane Structures," Chapter 5, "Folding and Telescopic Seating," without exceeding the allowable design working stresses of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each telescoping stand unit.

1.4 SUBMITTALS

- A. Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product Data for each type of telescoping stand specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- C. Shop Drawings showing fabrication and installation of telescoping stands including plans, elevations, sections, details of components, and attachments to other units of Work.
 - 1. For installed products indicated to comply with certain design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- D. Wiring diagrams from manufacturer for electrically operated units.
- E. Samples for verification of the following items, in the size indicated below. Prepare Samples from the same material to be used for the Work. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
- F. Maintenance data for telescoping stands, including detailed instructions for operation and annual inspection requirements of authorities having jurisdiction, to include in the operation and maintenance manual specified in Division 01.

1.5 QUALITY ASSURANCE

- A. NFPA Standard: Comply with requirements of NFPA 102, "Standard for Assembly Seating, Tents, and Membrane Structures," Chapter 5, "Folding and Telescopic Seating," except where more stringent requirements are indicated or imposed by authorities having jurisdiction.
- B. Installer Qualifications: Engage an experienced Installer to perform work of this Section who has specialized in installing types of telescoping stands similar to those required for this Project and who is acceptable to, or certified by, manufacturer of telescoping stands.
- C. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of telescoping stands that are similar to that indicated for this Project in material, design, and extent.
- D. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."
 - 1. Engage certified welders that have satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, have undergone recertification.
- E. Engineering Responsibility: Engineer telescoping stands by qualified professional engineer legally authorized to practice in jurisdiction where Project is located.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Check actual dimensions of construction affecting telescoping stands by accurate field measurements before fabrication and show recorded measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hussey Seating Co.
 2. Interkal Inc.
 3. Irwin Seating Company; Folding Bleacher Company Subsidiary.
 4. Royal Stewart Ltd.
 5. Universal; Interkal, Inc.

2.2 MATERIALS

- A. Panelam Deck: Provide manufacturer's standard polyethylene panelam deck.
1. Color: Gray.
- B. Structural Steel Shapes, Plates, and Bars: ASTM A 36 (ASTM A 36M), except where higher strength steel is indicated or standard with manufacturer.
- C. Commercial-Quality Uncoated Steel Sheet: ASTM A 366 (ASTM A 366M) cold-rolled steel sheet, or ASTM A 569 (ASTM A 569M) hot-rolled steel sheet, stretcher leveled.
- D. Structural-Quality Uncoated Steel Sheet: ASTM A 570 (ASTM A 570M) hot-rolled steel sheet, or ASTM A 611 cold-rolled steel sheet, stretcher leveled.
- E. High-Strength Uncoated Steel Sheet: ASTM A 607 hot- or cold-rolled steel sheet, stretcher leveled.
- F. Galvanized Steel Sheet: ASTM A 653, G60 (ASTM A 653M, Z180) coating designation, phosphatized, stretcher leveled.
- G. Steel Tubing: ASTM A 500, cold formed; or ASTM A 501, hot formed.
- H. Polyethylene Plastic Seats ASTM D 1248, Type III, Class B; molded, color-pigmented, textured, impact-resistant, structural formulation.
- I. Fasteners: Vibration proof, of size and material standard with manufacturer.

2.3 COMPONENTS

- A. Provide manufacturer's standard telescoping stands fabricated to comply with requirements indicated. Smoothly round corners, edges, and exposed fasteners to eliminate snagging and pinching hazards. Form exposed sheet metal with flat, flush surfaces, true to line and level, and

without cracking and grain separation. Perform welding by operators and processes complying with AWS requirements.

- B. Bench Seats and Skirts: Provide seats with uniform heights of not less than 16 inches (406.4 mm) or more than 18 inches (457.2 mm), as standard with manufacturer.
- C. Sculptured Seat Modules and Skirts: Provide sculptured seat modules with uniform heights of not less than 16 inches (406.4 mm) or more than 18 inches (457.2 mm), as standard with manufacturer. Provide 18-inch wide individual seating modules constructed of high density polyethylene structural foam. Each module shall have two longitudinal and five transverse internal ribs to provide additional structural integrity and resistance to impact. Each module shall have a full 1-inch interlock to the adjacent module both around the perimeter and along the internal ribs to eliminate pinching hazards and assure proper alignment. A steel-to-steel attachment of each module to a minimum 14 gage galvanized steel nose beam shall be provided for maximum rigidity. All such mounting hardware shall be concealed. End caps shall be provided at the ends of each bank of seating as well as at each aisle. Each module shall have a recessed area for seat numbering and shall include the numbering, unless noted otherwise.
 - 1. Material: Polyethylene plastic in color as selected by the Architect from manufacturer's full range of colors.
 - 2. Profile: Contoured seat surface with enclosed back, cantilevered to the rear to provide toe space beneath seat.
 - 3. Depth: 10 inches (254 mm).
- D. Cutouts for wheelchair accessible seating at first tier locations indicated. Provide front removable rails attached to front of second tier at rear of wheelchair accessible seating area. Provide full-width front closure panel at cutout that matches decking construction and finish and extends from underside of second tier to 1-1/2 inches (38.1 mm) from finished floor.
- E. Risers: Fabricate risers from steel sheet with painted or galvanized finish, as standard with manufacturer.
- F. Footrests: Fabricate fully closed footrests from panelam plywood, as standard with manufacturer.
- G. Understructure: Fabricate understructure from structural steel members of size, spacing, and form required to support design loads.
 - 1. Cantilever bench seat supports to produce toe space uninterrupted by vertical bracing.
- H. Support Column Wheels: Provide manufacturer's nonmarring, soft, rubber-face wheel assembly under each support column. Include wheels of size, number, and design required to support stands and to achieve smooth operation without damage to flooring surface, but not less than 4 per column or less than 3-1/2 inches (88.9 mm) in diameter and 1 inch (25.4 mm) wide.
- I. Aisles: Fabricate stands with the following aisle configuration, at locations and of widths indicated:
 - 1. Footrest-Level Configuration: Interrupt seats to provide aisle walking surfaces at footrest level.

- a. Provide manufacturer's standard automatic aisle closures to produce flush vertical face at aisles when system is stored.
- J. Row Spacing: Fabricate units with row spacing of 26 inches (660.4 mm), unless otherwise indicated.
- K. Row Rise: Fabricate units with row rise of between 10 inches (254 mm), as standard with manufacturer.
- L. Operation: Provide telescoping stands incorporating manufacturer's standard system of seating and understructure members that permit opening and closing of adjacent rows, allow individual and collective rows to be locked open for use, and close with vertical faces of upper skirts in the same vertical plane.
1. Tractive Electric Operation: Provide manufacturer's standard integral power operation of telescoping stands by a series of electric-motor-driven units mounted under first rows that apply tractive force to floor. Provide units with rubber rollers or tracks that will not mar or damage floor over which stands move. Control units by plug-in, walk-along pendant switch, as standard with manufacturer.
 - a. Limit Switches: Provide open and closed stop limit switches that automatically stop the integral power system when telescoping stands reach the fully opened or closed positions.
 - b. Motion Monitor: Provide flashing light with self-contained warning horn, rated at 85 decibels (dB) at 10 feet (3 m), mounted under telescoping seating for audio and visual warning during integral power operation.
 - c. Provide transformer, if required, to coordinate current characteristics of motor and control station with building electrical system.
- M. Accessories: Provide the following accessories of manufacturer's standard design and construction at locations indicated or required to comply with referenced code standard:
1. Non-slip abrasive tread nosings at vertical aisles.
 2. Intermediate aisle steps, fully enclosed, at each vertical aisle.
 3. Removable front steps, fully enclosed, at each vertical aisle, that engage with front row to prevent accidental separation or movement and are equipped with a minimum of 4 nonskid feet.
 4. Removable aisle handrails located at centerline of each vertical aisle and discontinuous with gaps or breaks at intervals not exceeding 5 rows. Equip handrails with an intermediate horizontal handrail below the top rail.
 5. End railings of telescoping, self-storing type.
 6. Rear fillers including supports for closing openings between top row and rear wall of adjoining construction.
 7. Gap fillers for closing openings between stand units or between stand units and adjoining construction.
 8. End panels covering exposed ends of stands in stored position.
 9. Safety End Closures: Provide self-storing safety end closures which are permanently attached to each end of a bank of seating so as to prevent unauthorized access to the area located directly beneath it. Closures shall be constructed from a heavy-duty vinyl coated

polyester fabric and attached in a manner such that the closure is taut in the open position and folds in a self-storing manner when the bank is closed.

10. Provide manufacturer's standard movable scorer's table.

- N. Power Connection: System shall accept one 208 volt, three phase, three wire, 15 amp feed per section of stands as indicated on Drawings. Manufacturer's system shall include distribution of power from this point to individual motors and controls. Manufacturer's system shall include local power disconnect.

- O. Electrical Boxes: Provide cutouts for recessed electrical boxes in center/front of lowest riser.

- P. General Layout Description:
 1. 7 Row Friction Power – wall attached 78'-0" with 10" seat module.
 2. 7 Row foot level aisles with self-storing F-rail.
 3. 7 Row intermediate steps.
 4. 1 Row 3'-0 1/4" notch-out with front rail.
 5. 1 Row recoverable 3'-0 1/4" notch-out.
 6. 7 Row self-storing end rail.
 7. 314 seats.

2.4 STEEL FINISHES

- A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel complying with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).

- B. Rust-Inhibitive Finish: Immediately after cleaning and pretreating, apply manufacturer's standard rust-inhibitive finish to exposed and concealed metal surfaces including understructure, except where other types of finishes are indicated.
 1. Epoxy Finish: Epoxy-resin-based finish consisting of prime coat and topcoat.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where telescoping stands are to be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of telescoping stands. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install telescoping stands to comply with manufacturer's instructions and Shop Drawings. Provide accessories indicated and anchors, fasteners, inserts, and other items required for installing and attaching units to adjoining construction.

3.3 ADJUSTING AND CLEANING

- A. On completion of installation, including work of other trades, lubricate, test, and adjust each telescoping stand unit to operate easily and to comply with manufacturer's specifications.
- B. Clean installed telescoping stands on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to demonstrate and train Owner's maintenance personnel as specified below.
 - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 2. Train Owner's maintenance personnel on procedures and schedules related to operation, troubleshooting, servicing, inspection, and maintenance.
 - 3. Review data in the operation and maintenance manuals.
 - 4. Schedule training with Owner, through Architect-Engineer, with at least 7 days' advance notice.

3.5 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure telescoping stands are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 12660

SECTION 129300 - SITE FURNISHINGS

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. Seating.
 - 2. Picnic tables.
 - 3. Bicycle racks.
 - 4. Basketball goal.
 - 5. Tetherball.
- B. Related Sections include the following:
 - 1. Section 033000 "Cast-in-Place Concrete" for installation of pipe sleeves cast or formed voids in concrete footings.
 - 2. Section 312000 "Earthwork" for excavation for installation of concrete footings.
- C. Products furnished in this Section, include pipe sleeves to be cast in concrete footings.

1.3 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.
- D. Delegated Design: Provide sealed engineering drawings for basketball goal and post complying with local code and all dead and live loads per the Drawings.
- E. Product Schedule: For site furnishings. Use same designations indicated on Drawings.
- F. Maintenance Data: For all site furnishings to be included in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of site furnishing(s) through one source from a single manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. 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, or electric-resistance-welded pipe complying with ASTM A 135.
 3. Tubing: Cold-formed steel tubing complying with ASTM A 500.
 4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500; 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 0.0897-inch (2.3-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.
- B. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, stainless steel; commercial quality, tamperproof, vandal and theft resistant, concealed, recessed, and capped or plugged hardware for surface mounted and sleeve anchored furnishings.
- C. 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.
- D. 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.

2.2 SEATING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide ANOVA; Element 6' Flat Bench or a comparable product by one of the following:
1. LandscapeForms Inc.
 2. Thomas Steele
 3. Victor Stanley, Inc.
- B. Provide manufacturer's recommended concrete substrate surface mounting system with stainless steel expansion anchors and epoxy.
- C. Location: As indicated on the Drawings.
- D. Frame Supports, Surface Mount Plates: Aluminum.
- E. Seat and Back:
1. Seat Material: Manufacturer's standard powder-coated system for steel and aluminum.
 2. Fasteners: Stainless steel.
 3. Seat Height: 16 inches to 18 inches maximum above finish grade.
 4. Overall Length: 72 inches.
 5. Overall Depth: 21 inches.
 6. Color: Silver frame with Parquet/Sage seat color.

2.3 BICYCLE RACKS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Landscape Forms Inc.; Model Emerson bike rack or comparable product by one of the following:
1. Bike Track, Inc.
 2. L. A. Steelcraft.
 3. Madrax.
 4. Maglin Furniture Systems Ltd.
- B. Description:
1. Racks for capacity of (2) bicycles per rack.
 2. Frame: Aluminum casting with powder-coat finish.
 3. Adjustable Leveler: Stainless steel round bar with anchor set screws, magni-coated.
 4. Anchor Cover: Aluminum casting.
 5. Size: 3.5-inch depth, 20-inch length, and 30-1/4-inch height.
 6. Finish: Powder coated.
 7. Color: Metallic Mercury, or as selected by Owner/Architect from manufacturer's full range.
 8. Surface Mount Hardware: Surface mount gusset plate and stainless steel hardware and anchor bolts into concrete.

2.4 BASKETBALL STANDARD

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Patterson-Williams; Model No. 1516-22-455 or comparable product by one of the following:
1. BCI Burke Company, LLC.
 2. GameTime; a PlayCore, Inc. Company.
 3. Henderson Recreation Equipment Ltd.
 4. Kay Park Recreation.
 5. Playworld Systems, Inc.
 6. Recreation Creations, Inc.
- B. Description:
1. Heavy-duty 4.5-inch diameter o.d. Schedule 40 galvanized steel post with 4 foot gooseneck offset.
- C. Backboard and Goal: Provide heavy-duty cast aluminum powder coated aluminum fan-shaped backboard with orange border and shooter's square and double-rim goal.
- D. Net:
1. Product: Subject to compliance with requirements, provide the following:
 - a. Patterson-Williams; Super Chain Net Model No. 44.
- E. Install in concrete footing, designed by manufacturer, to accommodate all live and dead loads per local codes and criteria stated in the Documents and sealed by a professional Engineer.
- F. Mounting Heights and Locations: Install goals at regulation height (10-feet) in locations as indicated on the Drawings.
- G. Warranties: Provide lifetime warranty on post, backboard and goal.

2.5 TETHERBALL STANDARD

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Burke; Tetherball Model No. 590-0003 with 3-inch minimum Schedule 40 galvanized steel post and In-Ground Sleeve Model No. 590-0034 for post removability; and Ball and Cord Model No. 590-0029 for a complete tetherball system, or equal products by one of the following:
1. Aalco Manufacturing Co.
 2. GameTime; a PlayCore, Inc. Company.
 3. Henderson Recreation Equipment Ltd.
 4. Kay Park Recreation.
 5. Playworld Systems, Inc.
 6. Porter Athletic, Inc.
- B. Tetherball Post: Secure tetherball post in place with tamper-proof hardware to sleeve per manufacturer's recommendations.

2.6 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. 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.
- E. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

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. 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.

2.8 STEEL FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

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 and positioned 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. 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 non-shrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

3.3 CLEANING

- A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION 129300

SECTION 131200 – CLIMBING WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Panelized rock climbing wall system.

1.3 SYSTEM DESCRIPTION

- A. Work of this Section is the furnishing and/or installation of a panelized rock climbing wall system utilizing cast glass fiber reinforced polymer (GFRP) panels simulating natural rock profiles, colors and textures.
- B. The panels may be mounted to either an existing structural building wall, or a structure designed and constructed for the purpose of supporting the panels. Climbing wall shall include handhold fastening systems, and specific equipment as defined in this Section.

1.4 QUALITY ASSURANCE

- A. Provide climbing wall systems by a single manufacturer.
- B. Manufacturer shall have a minimum of five years' experience with the manufacturing and installation of the climbing wall system specified herein. Installers shall have five years' experience installing the specified product.

1.5 SUBMITTALS

- A. Product data including manufacturer's specifications, standard details, details particular to this project, and installation drawings if applicable.
- B. Submit one sample of climbing wall substrate with the applied surface, minimum 12 inches by 12 inches, showing substrate, handhold fastener density and color and finish.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Protect products during transit, delivery, storage and handling to prevent damage and maintain integrity of components.
- B. Products shall be stored in accordance with manufacturer's recommendations in an area adjacent to the climbing wall installation.

1.7 WARRANTY

- A. Manufacturer shall warrant to the original purchaser for one year from the date of Substantial Completion that its products are free from defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Eldorado Wall Company; SOLIDRock™ or approved equal.

2.2 CLIMBING SURFACE

- A. The climbing panels shall be 4 feet by 4 feet in dimension and shall be composed of glass fiber reinforced polymer (GFRP) panels cast in rock-realistic molds, 1/4-inch in thickness.
 - 1. Surface coloration to be manufacturer's standard brown coloration with rock-like highlights and staining. Custom coloration chosen by Owner is optional.
- B. Climbing wall system shall provide modular climbing hold attachment locations compatible with 3/8-inch 16-thread fasteners for surface mount. Handhold fasteners shall be securely anchored to the subsurface with adhesive. Handhold fasteners shall be placed at minimum of 1 per sq. ft. of climbing wall surface area.

2.3 CLIMBING WALL FASTENERS

- A. Modular Handhold Bolts:
 - 1. Shall be 3/8-inch, 16 TPI socket head cap screws or flat head cap screws of appropriate length as suggested by and provided by the manufacturer of the climbing wall and handhold manufacturer.
- B. Handhold Fasteners (T-nuts or Flange Nuts):
 - 1. Glue-on fastener shall be 3/8-inch 16 TPI, 3-inch wide flange with perforations to increase flue bond.

2.4 CLIMBING PROTECTION/ANCHORS

- A. Protection anchors are not included in this specification. If protection anchors such as top rope anchors or floor anchors are desired, they must be designed and engineered for the facility.

2.5 CLIMBING WALL EQUIPMENT

A. Modular Handholds:

- 1. Composed of polyurethane to minimize breakage:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-approved equal:
 - 1) Egrips.
 - 2) Franklin Handholds.
 - 3) Soll Handholds.
- 2. Supply a quantity of eight handholds with each 4-foot by 4-foot climbing panel.
- 3. To include handhold bolt of appropriate length.

PART 3 - EXECUTION

3.1 PREINSTALLATION INSPECTION

- A. Verify that all surfaces are ready to receive work and are within specified tolerances.
- B. Verify that layout of the materials or equipment will not interfere with installed climbing wall.

3.2 INSTALLATION

- A. Erection of the climbing wall system shall be made by manufacturer or approved subcontractor with 5 years' minimum experience with specified climbing wall installation.
- B. Complete wall shall comply with specified tolerances and submittal requirements.

3.3 CLEANUP

- A. Clean area of debris from climbing wall installation and other construction operations.
- B. Separate waste materials in accordance with the construction waste management plan and place in designated areas.

3.4 INSPECTION

- A. The completed climbing wall shall undergo a full, complete and final inspection by a duly trained supervisor of the manufacturer, and shall be certified by the manufacturer that the finished product has been built in accordance with the manufacturer's approved installation drawings and these Contract Documents.
- B. The completed climbing wall shall undergo a full and complete final inspection by the Owner or Owner's representative at the completion of climbing wall installation.

3.5 TRAINING

- A. Provide a 4-hour minimum training session for the Owner's staff. Training shall cover the following topics, at a minimum:
 - 1. Climbing wall maintenance and periodic inspections.
 - 2. Route-setting methods and management.
 - 3. Sample handhold installation and removal.
 - 4. Climbing wall operations management.

3.6 PROTECTION

- A. General Contractor to provide final protection in a manner acceptable to the Owner and Architect that insures the climbing wall will be protected from damage or deterioration until the date of Substantial Completion.

END OF SECTION 131200

SECTION 133113 - TENSILE MEMBRANE/MESH STRUCTURES

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.
- B. Related Sections: The following Construction Specification Institute (CSI) MasterFormat™ divisions contain requirements relating to this section:
 - 1. Division 01 Sections for general requirements.
 - 2. Section 033000 "Cast-in-Place Concrete" for cast-in-place foundations.
 - 3. Division 05 Sections for metals, structural metal framing, metal fabrications, expansion control systems, and shop-applied metal coatings.
 - 4. Division 09 Sections for finishes, paints and coatings.

1.2 SUMMARY

- A. This Section includes the exterior architectural tensile Birdair Modular Fabric St. Tropez 100 (ST100) structures.
- B. The tensile structure contractor (hereafter referred to as "Subcontractor") shall be responsible for the detailing, fabrication, supply, and installation of the Work specified herein, some or all of which may be subcontracted by Subcontractor to others meeting the qualification requirements of Section 1.5. The intent of this specification is to establish in the first instance an undivided, single-source responsibility of the Subcontractor for all of the foregoing functions.
- C. Subcontractor's Work shall include, but not necessarily be limited to, the supply, fabrication, shipment, and erection of the following principal items:
 - 1. Two (2) Birdair ST100 Modular structure as indicated in this specification.
 - 2. Cables and end fittings.
 - 3. Perimeter, catenary, and sectionalized clamping system.
 - 4. Structural steel, including masts, trusses, struts, beams, and/or weldments, as indicated on the drawings.
 - 5. Fasteners and gasketing.
- D. The architectural membrane used in these structures shall be polytetrafluoroethylene ("PTFE," such as Teflon®) coated woven fiberglass. All references to "membrane" in this Section 13113, without exception, and whether singular, plural, or capitalized or not, are to such architectural membrane.

1.3 REFERENCES

- A. General: Except as otherwise shown or noted, all Work shall comply with the requirements of the following codes and standards:
1. Building Code: As indicated on the Drawings.
 2. American Institute of Steel Construction (AISC).
 - a. Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings
 - b. Code of Standard Practice for Steel Buildings and Bridges
 - c. Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design
 - d. Specification for Allowable Stress Design of Single-Angle Members
 - e. Seismic Provisions for Structural Steel Buildings
 3. American Society of Civil Engineers (ASCE).
 - a. ASCE 19: Structural Applications of Steel Cables for Buildings
 4. American Society for Testing and Materials (ASTM).
 - a. ASTM A586: Standard Specification for Zinc-Coated Steel Structural Strand
 - b. ASTM A603: Standard Specification for Zinc-Coated Steel Structural Wire Rope
 - c. ASTM D4851-88: Standard Test Methods for Coated and Laminated Fabrics for Architectural Use
 - d. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials
 - e. ASTM E108: Standard Test Methods for Fire Tests of Roof Coverings
 - f. ASTM E136: Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
 - g. ASTM C423: Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
 - h. ASTM E424: Standard Test Method for Solar Energy Transmittance and Reflectance of Sheet Materials
 5. American Welding Society (AWS).
 - a. AWS D1.1: Structural Welding Code
 - b. AWS 2.4: Symbols for Welding and Nondestructive Testing
 6. Aluminum Association.
 - a. Specifications for Aluminum Structures
 7. National Fire Protection Association (NFPA).
 - a. NFPA 701: Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

8. Steel Structures Painting Council (SSPC).
 - a. Steel Structures Painting Manual, Volumes 1 and 2

1.4 SYSTEM REQUIREMENTS

- A. General: Provide a structural tensile membrane system that complies with requirements specified herein by testing the Subcontractor's corresponding membrane system in accordance with the indicated test methods.
- B. Building Code Criteria: The tensile membrane structure shall comply with the code requirements and structural requirements as indicated on the Drawings.
- C. Life Safety: All tensile structures shall be detailed so that no life safety issue is created in the event of a loss of a part of the membrane/mesh. The tensile structure shall not rely on the membrane/mesh for structural stability.
- D. Fire Performance: Range of characteristics required of membranes:
 1. Burning Characteristics (ASTM E84).
 - a. Flame Spread: 5 max.
 - b. Smoke Generation (Tunnel Test): 20 max.
 2. Fire Resistance of Roof Coverings (ASTM E108).
 - a. Burning Brand: Class A
 3. Incombustibility of Substrates (ASTM E136).
 - a. Substrate Noncombustible: Pass
 4. Flame Resistance (NFPA 701 Small Scale, UL 94).
 - a. Flame Out: 1 second after
 - b. Char Length: 0.25-inch max.

1.5 QUALITY ASSURANCE

- A. Subcontractor Qualifications: Fabrication and erection of the tensile structure is limited to firms with proven experience in fabrication and construction of complex tensile structures. Such firms, through their own experience and/or that of their qualified subcontractors, shall meet the following minimum requirements:
 1. The Subcontractor shall have at least twenty five (25) years' experience in the successful fabrication and erection of permanent, custom tensile membrane structures.
 2. The Subcontractor shall have fabricated and erected at least twenty (20) PTFE-coated woven fiberglass tensile membrane structures, with at least five (5) structures of similar size and complexity as this project.

3. The Subcontractor shall demonstrate it has a fabrication facility of adequate capacity and will maintain a staff experienced in the fabrication of PTFE-coated woven fiberglass tensile membrane structures that will undertake the fabrication of this project.
4. The Subcontractor shall submit a Corporate Quality Control Manual describing the company's complete quality assurance program.
5. The Subcontractor must be ISO 9001:2008 certified in the design, construction and installation of fabric and cables based structures.

B. Qualified Subcontractors

1. Birdair, Inc.; Brian Dentinger; 65 Lawrence Bell Drive; Amherst, New York 14221; phone 716-204-2151; email briand@birdair.com; website www.birdair.com.

1.6 SUBMITTALS

A. General: Notwithstanding any provisions of these specifications that may appear to be to the contrary, any and all submittals by the Subcontractor shall be subject to review, approval, and adoption by the Project Engineer as part of the overall project design and engineering, and shall not create a contractual or other professional design relationship between the Subcontractor and either the Project Engineer or the Owner.

B. Product Data: Include manufacturer's specifications for materials, fabrication, installation, and recommendations for maintenance. Include test reports showing compliance with project requirements where test method is indicated.

1. Samples: Submit selection and verification samples.

C. Fabric Samples

D. Quality Assurance Submittals.

1. Test Reports: Provide test reports from a qualified testing laboratory that show compliance of the Subcontractor's PTFE-coated woven fiberglass tensile membrane system with specification requirements, as follows:
2. Certificates: Product certificates signed by the Subcontractor certifying materials comply with specified characteristics, criteria, and physical requirements.

E. Closeout Submittals.

1. Warranty: Project Warranty documents as described herein.
2. Record Documents: Project record documents for installed materials in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
3. Maintenance Manual: Submit two (2) copies of a maintenance manual for the tensile membrane structure to the Owner. The manual shall include a schedule for routine inspection, an inspection checklist, and warranty. During the system erection period, the Owner shall provide maintenance personnel to be trained in the use of the repair materials.

1.7 PRODUCT DELIVERY, HANDLING, AND STORAGE

- A. General: Refer to the Conditions of the Contract for product handling provisions.
- B. Materials shall be packed, loaded, shipped, unloaded, stored, and protected in a manner that will avoid abuse, damage, and defacement.

1.8 WARRANTY

- A. General: Refer to the Conditions of the Contract for project warranty provisions.
- B. After final payment, the Subcontractor shall furnish the Owner with a written Warranty, which warrants that the tensile structure, its perimeter attachment system, and the structural support system as supplied by the Subcontractor have been installed in accordance with the project specifications and will be free from defects in materials and workmanship that will impair their normal use or service. The Warranty shall start from the date of Substantial Completion of the tensile membrane structure; which shall be the first date on which the entire tensile membrane structure is subject to design prestress conditions, and continue for a period of one (1) year thereafter.

PART 2 - MATERIALS

2.1 ARCHITECTURAL MEMBRANE

- A. General: The membrane used in these structures shall be polytetrafluoroethylene ("PTFE," such as Teflon®) coated woven fiberglass. All references to "membrane" in this Section 13113, without exception, and whether singular, plural, or capitalized or not, are to such architectural membrane.
- B. The membrane shall meet the following general requirements:
 - 1. Source Quality Control: The primary materials shall be obtained from a single manufacturer. Secondary materials shall be those recommended by the primary manufacturer.
 - 2. Physical Characteristics: The following indicates a range of physical properties typical of PTFE Architectural Membranes. The determination of specific characteristics and selection of a membrane shall be derived from project engineering by the Project Engineer.
 - a. Coated Fabric Weight (oz./sq. yd.): 24 min. to 45.5 nom. (ASTM 4851)
 - b. Thickness (mils): 18 min. to 36 nom. (ASTM 4851)
 - c. Strip Tensile (lbs./in., avg.):
 - 1) Dry, Warp: 520 min. to 975 min. avg. (ASTM 4851)
 - 2) Dry, Fill: 380 min. to 900 min. avg. (ASTM 4851)
 - d. Strip Tensile, After Crease Fold (lbs./in., avg.):
 - 1) Dry, Warp: 375 min. to 760 min. avg. (ASTM 4851)
 - 2) Dry, Fill: 350 min. to 735 min. avg. (ASTM 4851)

- e. Trapezoidal Tear (lbs./in., avg.):
 - 1) Warp: 35 min. to 95 min. avg. (ASTM 4851)
 - 2) Fill: 35 min. to 120 min. avg. (ASTM 4851)
- f. Solar Transmission (%): 7 to 22 nom. (ASTM E424)
- g. Solar Reflectance (%): 70 to 73 nom. (ASTM E424)

C. Materials.

- 1. Base Fabric: The yarns used shall be of the highest commercial quality, essentially free of broken fibers and fully suitable for coating. The fabric shall be woven with uniform tension and crimp in the warp and fill yarns and free of defects deleterious to the coating process.
 - a. Color: Selected by the Architect from manufacturer's full range of colors.
- 2. Fluorocarbon Coatings: The coating materials shall be fluorocarbon resins formulated specifically for architectural applications. These materials shall be applied to form a weatherized barrier between the fiberglass yarns and the environment. The bulk of the coating shall be formulated dispersions of PTFE fluoropolymer resin and additives to enhance abrasion and tear resistance, impart pigmentation, or modify solar transmission. The additives shall not constitute more than 20% by weight of the total coating or 25% by weight of any individual layer. The surface shall be totally a fluoroethylenepropylene ("FEP") resin to facilitate heat welding.
- 3. After weaving, the base fabric shall be cleaned and primed to achieve optimum mechanical properties of the coated membrane. The coating, described above, shall be virtually free of mud cracks and pinholes. The coating shall be applied evenly to both sides of the fabric and the FEP fluorocarbon resin topcoat shall be of sufficient thickness to permit proper heat fusion of joints with the recommended die pressure and temperature.

2.2 CABLES AND END FITTINGS

A. Materials:

- 1. All structural wire rope cables shall conform to the latest revision of ASTM A603.
- 2. All structural strand cables shall conform to the latest revision of ASTM A586.
- 3. All cables shall be coated to "Class A" zinc coating throughout.

B. Fabrication:

- 1. Cable fabricator shall provide effective quality control over all fabrication activities. Inspection of the place of fabrication may occur at any time to verify proper quality control. This inspection does not relieve the fabricator from meeting the requirements of this specification. This inspection is at the cost of the General Contractor or owner.
- 2. All cables shall be manufactured to the following length tolerances at 70 degrees Fahrenheit (23 degrees Celsius):
 - a. Length < 70 feet (213 meters): 1/4 inch (6.4 mm)
 - b. Length 70 to 270 feet (32.3 to 82.3 meters): 0.03% of length
 - c. Length > 270 feet (82.3 meters): 1 inch (25.4 mm)

3. Cables shall have a continuous longitudinal paint stripe (1/4-inch wide max.) along their top surface unless noted otherwise.
4. Index markings shown shall be a circumferential paint stripe (1/4-inch wide max.).
5. All cables and end fittings shall be delivered clean and dry.
6. All swaged and splattered fittings shall be designed and attached to develop the full breaking strength of the cable. Thimble end fittings shall develop a minimum of 90% of the cable breaking strength.
7. Swaged end fittings, pins, nuts, and washers shall be electro-galvanized. Any damage to the zinc coating shall be cleaned and painted with a gray zinc-rich paint per ASTM A780.
8. Splattered end fittings shall be hot dip galvanized per ASTM A153. Any damage to the zinc coating shall be cleaned and painted with a gray zinc-rich paint per ASTM A780.

2.3 STRUCTURAL STEEL

- A. General: The structural steel fabrication shall comply with the latest revision of all applicable codes, standards, and regulations including the following:
 1. ASTM (as referenced).
 2. AISC: "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" and "Code of Standard Practice for Steel Buildings and Bridges."
 3. SSPC: "Steel Structures Painting Manual, Volumes 1 and 2."
 4. Research Council on Riveted and Bolted Structural Joints: "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
 5. AWS D1.1 and AWS A2.4.
- B. In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards or these specifications, the provisions of the more stringent shall govern.
- C. Submittals:
 1. General: Submit the following in accordance with Conditions of the Contract and Section 013300 "Submittal Procedures."
- D. Materials:
 1. Structural steel for plates and bars shall conform to the requirements of ASTM A36 or ASTM A572, Grade 50, unless noted otherwise.
 2. Structural pipe shall conform to ASTM A53, Types E or S, Grade B.
 3. Structural tubing shall conform to ASTM A500 Grade B.
 4. Structural bolts:
 - a. High Strength Bolts: ASTM A325, unless noted otherwise.
 - b. Common Bolts and Nuts: ASTM A307.
 - c. Threaded Rods: ASTM A36, unless noted otherwise.
 5. Other Materials: All other materials, not specifically described but required for a complete and proper installation of structural steel, shall be provided and shall be new, free from rust, first quality of their respective kinds, and subject to the approval of the Subcontractor.
- E. Accessories:

1. Base Plates and Anchor Bolts:

- a. Base plates supported on concrete, whether shop attached or shipped loose, shall be furnished and set on shims or leveling plates. Grouting shall be by the General Contractor.
- b. Anchor bolt locations shall be furnished by the Subcontractor and used by the General Contractor to set the bolts. The General Contractor is to check carefully the setting of the bolts to their proper position prior to pouring of concrete. Anchor bolts, provided by the General Contractor, shall have two (2) nuts and washers. Damaged threads shall be repaired or be cut to permit full tightening of nuts.

F. Fabrication.

1. Workmanship: All members, when finished, shall be true and free of twists, bends, and open joints between the component parts. Members shall be thoroughly straightened in the shop by methods that will not injure them, before being worked on in any way.

- a. Properly mark materials, and match-mark when directed by the Subcontractor, for field assembly.

2. Connections:

- a. Connections shall be as indicated on the drawings. When details are not shown the connections shall conform to the requirements of the AISC.
- b. Provide high-strength threaded fasteners for all structural steel bolted connections, unless noted otherwise.
- c. Combination of bolts and welds in the same connection are not permitted, unless otherwise detailed.
- d. Welded Connections:

- 1) Definitions: All terms herein relating to the welds, welding and oxygen cutting shall be construed in accordance with the latest revision of "Standard Definitions of Welding Terms and Master Chart of Welding Processes" of the AWS.
- 2) Operators: Welds shall be made only by operators who have been previously qualified by tests, as prescribed in AWS D1.1 to perform the type of work required.
- 3) Welding equipment shall be of sufficient capacity and maintained in good working condition, capable of adjustment in full range of current settings. Welding cables shall be adequate size for the currents involved and grounding methods shall be such as to insure proper machine operation.
- 4) No welding shall begin until joint elements are clamped in proper alignment and adjusted to dimensions shown on the drawings with allowance for any weld shrinkage that is expected. No members are to be spliced without prior approval.
- 5) All welding shall be done in accordance with the reference specifications, with the following modifications and additions:
 - a) All field welding shall be done by manual shielded metal-arc welding.
 - b) All groove welds shall have complete penetration, unless otherwise specified on the drawings.

- c) The minimum preheat and interpass temperature requirements shall be as required per AWS D1.1.
 - 6) Welding Sequence: Heavy sections and those having a high degree of restraint must be welded in a sequence with the proper preheat and post-weld heat treatment such that no permanent distortion occurs. Submit a welding sequence for approval for these types of connections.
 - 7) Oxygen Cutting: Manual oxygen cutting shall be done only with a mechanically guided torch. Alternatively, an unguided torch may be used provided the cut is not within 1/2 inch of the finished dimension and the final removal is completed by chipping or grinding to produce a surface quality equal to that of the base metal edges. The use of oxygen-cut holes for bolted connections will under no circumstances be permitted, and violation of this clause will be sufficient cause for the rejection of any pieces in which oxygen-cut holes exist.
3. Tolerances: All tolerances shall be as per the AISC "Code of Standard Practice for Steel Buildings and Bridges."
 4. Paint System, Three-Part:
 - a. Source Quality Control: Primary materials shall be obtained from a single manufacturer. Secondary materials shall be those recommended by the primary manufacturer.
 - b. Surface Preparation and Prime Coat:
 - 1) The surface shall be commercially blast cleaned in conformance with SSPC-SP 6, after all fabrication operations such as machining and welding are complete. There shall be no more than eight hours' time lapse between the surface preparation and the application of the prime coat.
 - 2) The primer shall be Tnemec Series 90-97 Tnemec-Zinc or approved equal and shall conform to SSPC-Paint 20.
 - 3) The primer shall be mixed and applied in accordance with the manufacturer's instructions and shall meet the requirements of SSPC-Paint 20. The minimum dry film thickness shall be 3.0 to 5.0 mils.
 - c. Intermediate Coat:
 - 1) The intermediate coat shall be Tnemec Series N69 Hi-Build Epoxoline II or approved equal and shall conform to SSPC-Paint 22.
 - 2) The intermediate coat shall be mixed and applied in accordance with the manufacturer's instructions and minimum dry film thickness shall be 3.0 to 5.0 mils.
 - d. Finish Coat:
 - 1) The finish coat shall be Tnemec Series 75 (Semi-Gloss) Endura-Shield or approved equal and shall conform to SSPC-PS Guide 17.00.
 - 2) The finish coat shall be mixed and applied in accordance with the manufacturer's instructions and the minimum dry film thickness shall be 3.0 to 5.0 mils.

- e. Three-Part System Thickness: The minimum system thickness shall be 10.0 mils.
- f. Color: The paint color shall be as specified on the drawings or selected by the Architect.
- g. Quality: The dry paint shall be uniform and continuous with no voids or puddles and shall not be broken by scratches or nicks. Although the Subcontractor's Quality Assurance personnel may witness the painting operation, this does not relieve the Painting Subcontractor of the responsibility for meeting the quality and workmanship requirements of these specifications.
- h. Care and Handling: The Painting Subcontractor shall make every reasonable effort to ensure that the painted steel is thoroughly dry and that is handled carefully to prevent damage to the paint and to reduce field repairs. Nylon slings should be used when handling the painted steel.
- i. Certification: The Painting Subcontractor shall be required to certify the paint manufacturer's name, paint identification, conformance with manufacturer's written instructions, and the paint dry mil thickness.

G. Source Quality Control:

1. Testing:

- a. An independent testing laboratory paid for by the Owner shall perform testing and inspection of the structural steel and welding. All welds shall be tested by visual, dye penetrant, magnetic particle methods, or ultrasonic methods in accordance with instructions from the Subcontractor.
- b. The Subcontractor and the testing laboratory inspector shall be permitted to inspect the work in the shop or field throughout fabrication and erection.
- c. The inspector shall check for workmanship of steel, both in the shop and field, and check general compliance with the Contract Documents and steel shop drawings. The inspector shall record types and locations of all defects found in the work and measures required and performed to correct such defects.
- d. The steel fabricator shall make all repairs to defective work to the satisfaction of the inspector and at no additional cost to the Subcontractor.
- e. The inspector shall submit reports of his inspection and test findings to the Subcontractor. He shall record all defects found with subsequent repair operations and submit reports to the Subcontractor.
- f. The work of the independent inspector shall in no way relieve the steel fabricator of his responsibility to comply with all requirements of the Contract Documents.

H. Product Handling and Protection: Use all means necessary to protect structural steel before, during, and after installation and to protect the installed work and materials of all other trades.

I. Rejection and Replacement:

- 1. In the event of damage to the steel, immediately make all repairs and replacements necessary to the approval of and at no additional cost to the Subcontractor.
- 2. Any materials or welding rejected through inspection either in the shop, mill or field must be promptly replaced to the satisfaction of, and at no additional cost to, the Subcontractor.

J. Qualifications of Steel Fabricator: The steel fabricator shall have not less than five (5) years' continuous experience in the fabrication of structural steel.

2.4 FASTENERS

- A. General: Provide fasteners used to secure clamp systems to curbs and cables, assemblage of clamp systems, and other fasteners as required to complete the work specified herein.
- B. Materials:
 - 1. All work shall comply with the latest edition of ASTM standards and American Iron and Steel Institute (AISI), as referenced herein.
 - 2. Fasteners used in membrane clamping systems shall be stainless steel. Bolts and studs shall conform to ASTM F593, Type 304. Nuts shall conform to ASTM F594, Type 316. Washers shall be plain, narrow, and conform to AISI Type 18-8.
 - 3. All clamping systems subjected to relative movement between clamping and curb shall receive a split-ring lock washer conforming to AISI Type 18-8.
 - 4. Unless otherwise specified on the drawings, all other bolts and nuts shall conform to ASTM A307-76B, zinc plated to conform to ASTM B633 Class Fe/Zn 8 type III.
- C. Source Quality Control: The manufacturer shall certify that all fasteners comply with the above referenced specifications.

PART 3 - EXECUTION

3.1 FABRICATION OF MEMBRANE PANELS

- A. Fabric Membrane:
 - 1. Membrane assembly shop drawings shall include all information necessary for the fabrication by the Subcontractor of the tensile membrane structure. They shall include size and shape of envelope, type and location of shop and field connections, size, type, and extent of all heat-welded seams.
 - 2. The Subcontractor shall take necessary care to plan and assemble the fabricated sections such that the assembly has no shop patches. Splices, if any, shall be patterned into a symmetrical and repetitive geometric arrangement within the assembly, shown on the shop drawings and, where feasible, hidden by structural members.
 - 3. All fabricated joints shall have a minimum of 90% of the total strength of the coated membrane in strip tensile testing. All structural joints shall be fused in accordance with industry standards and shall maintain the integrity of the coating. PTFE-coated woven fiberglass membranes shall be heat-sealed only.
 - 4. Biaxial Test: At least one (1) representative sample of the outer membrane shall be biaxially test loaded. Membrane compensation in patterning shall be based upon the results of the biaxial test loading.

3.2 ERECTION OF MODULAR ASSEMBLIES

- A. Prior to installation of the assemblies, the Subcontractor shall meet with the General Contractor to review the erection procedure and scheduling. The Subcontractor shall coordinate all work with other trades.

- B. No trade shall have access to, or work from the modular structures, unless authorized by the Subcontractor in writing.
- C. Erection of Structural Steel:
 - 1. The Subcontractor shall employ a competent foreman to supervise all work of steel erection. This foreman shall be present at all times during the Subcontractor's scope of work.
 - 2. All precautions shall be taken to ensure an accurately located and completely safe and stable structure at all times. Adequate guy cables shall be used throughout the work and all erection bolts shall be drawn up tight.
 - 3. All steel shall be accurately aligned before permanent connections are made.
 - 4. Temporary bracing shall be left in place as long as may be required for safety. The bracing shall be located so it does not interfere with the erection of the tensile structure, and can be removed as required during construction.
 - a. The structure is to be self-supporting and stable after the building is fully completed. It is the Subcontractor's sole responsibility to determine the erection procedure and sequence and to ensure the safety of the building and its component parts during erection. This includes the addition of whatever temporary bracing, guys or tie-downs that may be necessary. Such materials shall be removed by the Subcontractor and remain his property after completion of the project.
 - 5. Erection tolerances shall be specified in the AISC "Code of Standard Practice for Steel Buildings and Bridges," unless otherwise indicated.

3.3 PROTECTION AND CLEANING

- A. Protect work from damage and deterioration during installation.
- B. Upon completion of tensile membrane structure installation:
 - 1. The Subcontractor shall clean all surfaces of the system's components in conformance with the membrane manufacturer's recommendations.
 - 2. Inspect the system and repair membrane/mesh panels that have become damaged. Repairs shall be executed in such a way that they are visually acceptable.
- C. Further protection of the work and final cleaning, if necessary, shall be the responsibility of the General Contractor.

END OF SECTION 133113

SECTION 142123.16 - MACHINE-ROOM-LESS ELECTRIC TRACTION PASSENGER
ELEVATORS

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 machine-room-less electric traction passenger elevators.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for purchase contract for elevators negotiated by Owner and assigned to Contractor.
 - 2. Section 015000 "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
 - 3. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
 - 4. Section 051200 "Structural Steel Framing" for the following:
 - a. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for subsills.
 - 5. Section 055000 "Metal Fabrications" for the following:
 - a. Attachment plates and angle brackets for supporting guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for subsills.
 - e. Pit ladders.
 - f. Cants made from steel sheet in hoistways.
 - 6. Section 096519 "Resilient Tile Flooring" for finish flooring in elevator cars.
 - 7. Section 221489 "Sump Pumps" for sump pumps, sumps, and sump covers in elevator pits.
 - 8. Section 271000 "Telecommunications Cabling" for twisted pair cable for telephone service for elevators.
 - 9. Section 283111 "Fire-Alarm System" for smoke detectors in elevator lobbies to initiate emergency recall operation, for heat detectors in shafts to disconnect power from elevator equipment before or on sprinkler activation, and for connection to elevator controllers.

1.3 DEFINITIONS

- A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include capacities, sizes, performances, operations, safety features, finishes, and similar information.
 - 2. Include Product Data for car enclosures, hoistway entrances, and operation, control, and signal systems.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment.
 - 2. Include large-scale layout of car-control station and standby power operation control panel.
 - 3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
- C. Samples for Initial Selection: For each type of exposed finish involving color selection.
- D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; 3-inch- (75-mm-) square Samples of sheet materials; and 4-inch (100-mm) lengths of running trim members.

1.5 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 and pit layout and dimensions, as indicated on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.
- D. Sample Warranty: For special warranty.

1.6 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 five-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.
- B. Source Limitations: Obtain elevators through one source from a single manufacturer.
 - 1. Provide major elevator components, including pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cabs, and entrances, manufactured by a single manufacturer.
- 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 per 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 and the system will be fully operational after the seismic event."
 - 2. Provide earthquake equipment required by ASME A17.1/CSA B44.
 - 3. Provide seismic switch required by ASCE/SEI 7.
 - 4. Design earthquake spectral response acceleration short period (SDS) for Project is .123.
 - 5. Project Seismic Design Category: B.
 - 6. Elevator Component Importance Factor: 1.5.
- D. Accessibility Requirements: Comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
- E. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

1.8 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.

1.9 COORDINATION

- A. Coordinate installation of inserts, sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, inserts, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.
- B. Furnish well casing and coordinate delivery with related excavation work.
- C. Coordinate locations and dimensions of work specified in other Sections that relates to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways and pits.

1.10 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: 1year from date of Substantial Completion.

1.11 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, provide one year's full maintenance service 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 at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.
 - 2. Include 24-hour-per-day, 7-day-per-week emergency callback service.
 - a. Response Time: Two hours or less.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Ecospace Series, By KONE Inc., or comparable product by the following:
1. ThyssenKrupp Corp.

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 and the system will be fully operational after the seismic event."
 2. Affected peak velocity acceleration (A_v) for Project's location is listed in Drawings.
 3. Provide earthquake equipment required by ASME A17.1/CSA B44.
 4. Provide seismic switch required by ASCE/SEI 7.
 5. Design earthquake spectral response acceleration short period (S_d s) for Project is indicated on Structural Drawings.
 6. Project's Seismic Design Category: See Structural Drawings.
 7. Elevator Component Importance Factor: See Structural Drawings.

2.3 ELEVATORS

- A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.
- B. Elevator E1 Description:
1. Model: Ecospace.
 2. Type: Gearless Traction Elevator.
 3. Rated Load: 3500 lb (1589 kg).
 4. Rated Speed: 150 fpm (0.75 m/s).
 5. Operation System: Single Automatic.
 6. Auxiliary Operations:
 - a. Standby-powered lowering.
 - b. Battery-powered automatic evacuation.

7. Security Features: Keyswitch operation.
8. Car Enclosures:
 - a. Inside Width: Not less than 80 inches (2032 mm) from side wall to side wall.
 - b. Inside Depth: Not less than 66 inches (1676 mm) from back wall to front wall (return panels).
 - c. Inside Height: Not less than 96 inches (2743 mm) to underside of ceiling.
 - d. Front Walls (Return Panels): Satin stainless steel, No. 4 finish.
 - e. Car Fixtures: Satin stainless steel, No. 4 finish.
 - f. Side and Rear Wall Panels: Satin stainless steel, No. 4 finish.
 - g. Reveals: Satin stainless steel, No. 4 finish.
 - h. Door Faces (Interior): Satin stainless steel, No. 4 finish
 - i. Door Sills: Aluminum.
 - j. Ceiling: Standard Translucent Panels: Polygal Translucent three panel suspended ceiling with T-5 Fluorescent lighting and Brushed Aluminum frame.
 - k. Handrails: 1-1/2 inches (38 mm) round satin stainless steel, No. 4 finish, at sides and rear of car.
 - l. Floor prepared to receive resilient tile flooring (specified in Section 096519 "Resilient Tile Flooring").
9. Hoistway Entrances:
 - a. Width: 36 inches (914 mm) inches (1372 mm).
 - b. Height: 96 inches (2438 mm).
 - c. Type: Single-speed side sliding.
 - d. Frames: Satin stainless steel, No. 4 finish.
 - e. Doors and Transoms: Satin stainless steel, No. 4 finish.
 - f. Sills: Aluminum.
10. Hall Fixtures: Satin stainless steel, No. 4 finish.
11. Additional Requirements:
 - a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.

2.4 TRACTION SYSTEMS

- A. Elevator Machines: Permanent magnet, variable-voltage, variable-frequency, ac-type hoisting machines and solid-state power converters.
 1. Provide nonregenerative system.
- B. Fluid for Hydraulic Buffers: Fire-resistant fluid.
- C. 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.

- D. Machine Beams: Provide steel framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 055000 "Metal Fabrications" for materials and fabrication.
- E. Car Frame and Platform: Bolted- or welded-steel units.
- F. Guides: Roller guides, provide guides at top and bottom of car and counterweight frames.

2.5 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: If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it is lowered to a preselected floor, opens its doors, and shuts down. If car is below the preselected floor, it is lowered to the next lower floor, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
- C. General: Provide manufacturer's standard microprocessor operation system as required to provide type of operation indicated.
- D. Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators where indicated:
 - 1. Single-Car Battery-Powered Lowering: If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it is lowered to a preselected floor, opens its doors, and shuts down. If car is below the preselected floor, it is lowered to the next lower floor, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
- E. Security Features: Provide the following security features. Security features shall not affect emergency firefighter's service.
 - 1. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at car control stations and hall push-button stations. Key is removable only in deactivated position.

2.6 DOOR REOPENING DEVICES

- A. 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.
- B. 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.

2.7 CAR ENCLOSURES

- A. General: Provide steel-framed car enclosures with nonremovable wall panels, with removable 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 (15.9-mm) nominal thickness.
 2. Floor Finish: VCT1, as specified in 096519 "Resilient Tile Flooring".
 3. Stainless-Steel Wall Panels: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
 4. Plastic- Laminate Wall Panels: Plastic laminate adhesively applied to 1/2-inch (13-mm) fire-retardant-treated particleboard 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.
 - a. Color, Texture and Pattern: As selected by Architect from manufacturer's full range.
 5. Fabricate car with recesses and cutouts for signal equipment.
 6. Fabricate car door frame integrally with front wall of car.
 7. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
 8. Sight Guards: Provide sight guards on car doors.
 9. Sills: Extruded metal, with grooved surface, 1/4 inch (6.4 mm) thick.
 10. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent acrylic or other permanent rigid plastic.
 11. Handrails: Manufacturer's standard handrails, of shape, metal, and finish indicated.

2.8 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: 1 hour.

- C. Materials and Fabrication: Manufacturer's standards, but not less than the following:
1. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than 3 inches (76 mm) high, on both inside surfaces of hoistway door frames.
 2. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
 3. Sight Guards: Provide sight guards on doors matching door edges.
 4. Sills: Extruded metal, with grooved surface, 1/4 inch (6.4 mm) thick.
 5. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.

2.9 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. Swing-Return Car-Control Stations: Provide car-control stations mounted on rear of hinged return panel adjacent to car door and with buttons, switches, controls, and indicator lights projecting through return panel but substantially flush with face of return panel.
1. Mark buttons and switches for 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.
- D. 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.
- E. 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 Section 283111 "Fire Alarm System."
- F. 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.

- G. Hall Push-Button Stations: Provide one hall push-button station at each landing.
 - 1. Provide manufacturer's standard wall-mounted units.
 - 2. Equip units with buttons for calling elevator and for indicating applicable direction of travel.
 - 3. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in Section 283111 "Fire Alarm System."
- H. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide one of the following:
 - 1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.
- I. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
 - 1. At manufacturer's option, audible signals may be placed on cars.
- J. Hall Position Indicators: Provide illuminated, digital-display-type position indicators, located above hoistway entrance at ground floor. Provide units with flat faceplate for mounting and with body of unit recessed in wall.
 - 1. Integrate ground-floor hall lanterns with hall position indicators.
- K. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.

2.10 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. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.
- G. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063.

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. Examine hoistways, hoistway openings, and pits as constructed; 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. Comply with manufacturer's written instructions.
- 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 standards for workmanship and for qualifications of welding operators.
- 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. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.
- E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- F. Leveling Tolerance: 1/8 inch (3 mm), up or down, regardless of load and travel direction.
- G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- H. Locate hall signal equipment for elevators as follows unless otherwise indicated:
 - 1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.
 - 2. Place hall lanterns either above or beside each hoistway entrance.
 - 3. Mount hall lanterns at a minimum of 72 inches (1829 mm) 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: Comply with the following requirements for elevator used for construction purposes:
 - 1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
 - 2. Provide strippable protective film on entrance and car doors and frames.
 - 3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
 - 4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
 - 5. Do not load elevators beyond their rated weight capacity.
 - 6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
 - 7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s).
- B. Check operation of elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE SERVICE

- 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 at rated speed and capacity. 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 142123.16