

PROJECT MANUAL

CJMW ARCHITECTURE

Museum of the Marine

Jacksonville
North Carolina

Commission No. 06.0070

Volume 1

Museum *of the*
MARINE



Community • Corps • Carolinas

30 December 2011

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PROJECT TITLE PAGE

PROJECT MANUAL for:

PROJECT:

Museum of the Marine
Jacksonville, North Carolina

ISSUE DATE:

30 December 2011

COMM. NUMBER:

06.0070

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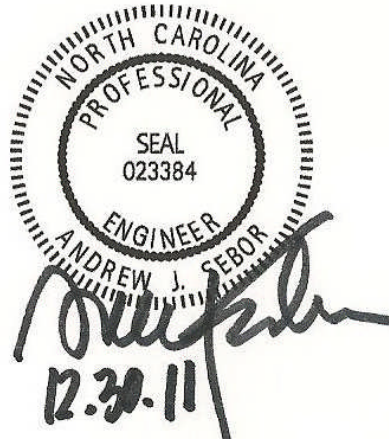
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**REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING
ANALYSIS
MARINE CORPS MUSEUM OF THE CAROLINAS
JACKSONVILLE, NORTH CAROLINA**



PREPARED FOR:

**LT. COL. JIM WILLIAMS, USMC (RET)
MUSEUM OF THE MARINE
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ECS CAROLINAS, LLP PROJECT NO.: 22.13112

SEPTEMBER 13, 2007



ECS Carolinas, LLP

Geotechnical • Construction Materials • Environmental

September 13, 2007

Lt. Col. Jim Williams, USMC (Ret)
Museum of the Marine
200 Valencia Drive
Suite 113
Jacksonville, North Carolina 28546

Re: Report of Subsurface Exploration and Geotechnical Engineering Evaluation
Marine Corps Museum of the Carolinas
Jacksonville, North Carolina

ECS Project No.: 22.13112

Dear Mr. Williams:

As authorized by your acceptance of our proposal number 9863, dated February 23, 2007, ECS Carolinas, LLP has completed a subsurface exploration for the subject project. This report presents the results of the field exploration; laboratory testing and engineering analysis, along with our recommendations for design of geotechnical related items.

We appreciate the opportunity to be of service to you during the design phase of this project and look forward to our continued involvement during the construction phase. If you have any questions concerning the information and recommendations presented in this report, please contact us at (910) 686-9114 for further assistance.

Respectfully submitted,

ECS CAROLINAS, LLP

A handwritten signature in black ink, appearing to read 'Winslow Goins'.

Winslow E. Goins, E.I.
Project Manager

A handwritten signature in black ink, appearing to read 'Walid M. Sobh'.

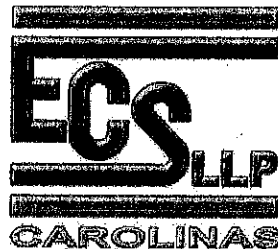
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**REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING
ANALYSIS
MARINE CORPS MUSEUM OF THE CAROLINAS
JACKSONVILLE, NORTH CAROLINA**

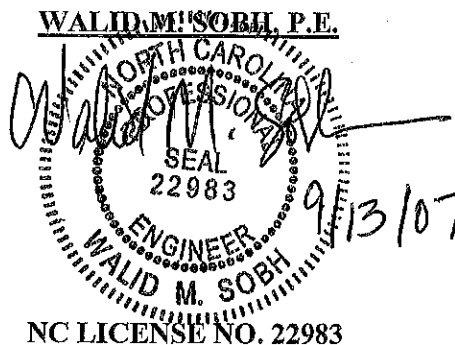
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NC LICENSE NO. 22983

SEPTEMBER 13, 2007

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1.0 EXECUTIVE SUMMARY

This report contains the results of our subsurface exploration and geotechnical engineering analysis for the proposed site located off of Montford Point Road in Jacksonville, North Carolina. At the time of our field exploration, the site was wooded. Several ditches traverse the site. The site is relatively level.

We understand that a proposed Marine Corps Museum will be constructed on the site. The structure will be a one-story steel framed structure with an enclosed partial 2nd floor. A free standing Hall of Honor building will also be constructed on site. The Hall of Honor building will feature a steel framed circular roof. A one-story tall, continuous curved site wall wraps around the outdoor reflection pool through the Museum building area and then curls around the free-standing Hall of Honor. The site wall will be clad with stone and constructed with formed cast-in-place concrete. The anticipated maximum foundation loads are 200 kips for column loads and 6 kips per foot for wall loads. Project specific information was not available at the time this report was prepared.

Approximately 6 to 8 inches of organic topsoil was reported by the drillers at the boring locations. Beneath the surface to a depth of 30 feet, the test borings typically encountered intermittent layers of loose to very dense slightly silty, silty and clean sands (SP-SM, SM, SP) and soft to very stiff silts and clays (ML, MH, CL, CH).

In summary, the proposed construction can be supported on conventional shallow foundations. The shallow foundations may be designed to bear on either properly compacted engineered fill or suitable natural soils. For foundations designed and constructed in accordance with the recommendations provided in this report, a net allowable soil bearing pressures of 2,000 pounds per square foot (psf) is recommended for use in proportioning shallow foundations.

Specific information regarding the subsurface exploration procedures used, the site and subsurface conditions at the time of our exploration, and our conclusions and recommendations concerning the geotechnical design and construction aspects of the project are discussed in detail in the subsequent sections of this report. Please note this Executive Summary is an important part of this report and should be considered a "*summary*" only. The subsequent sections of this report constitute our findings, conclusions, and recommendations in their entirety.

Prepared By:
Winslow E. Goins, E.I.
Project Manager

Reviewed By:
Walid M. Sobh, P.E.
Principal Engineer

2.0 PROJECT OVERVIEW

2.1 Project Information

Our understanding of the proposed development is based upon our discussions with representatives of EDA, PA and a review of the site plan provided to ECS by Calloway, Johnson Moore & West, P.A. The proposed site is located off of Montford Point Road in Jacksonville, North Carolina. At the time of our field exploration, the site was wooded. Several ditches traverse the site. The site is relatively level.

We understand that a proposed Marine Corps Museum will be constructed on the site. The structure will be a one-story steel framed structure with an enclosed partial 2nd floor. A free standing Hall of Honor building will also be constructed on site. The Hall of Honor building will feature a steel framed circular roof. A one-story tall, continuous curved site wall wraps around the outdoor reflection pool through the Museum building area and then curls around the free-standing Hall of Honor. The site wall will be clad with stone and constructed with formed cast-in-place concrete. The anticipated maximum foundation loads are 200 kips for column loads and 6 kips per foot for wall loads. Project specific information was not available at the time this report was prepared.

2.2 Scope of Work

The conclusions and recommendations contained in this report are based on the results of the following:

- fifteen electronic cone penetration test (CPT) test borings
- one seismic CPT test boring with shear wave velocity testing
- engineering analyses of the field findings with respect to the provided project information

2.3 Purposes of Exploration

The purpose of this exploration program was to determine the soil and groundwater conditions at the site and to develop engineering recommendations to assist in the design and construction of the proposed project. We accomplished these objectives as follows:

- performing a site reconnaissance to evaluate the existing site conditions
- drilling test borings to explore the subsurface soil and groundwater conditions
- analyzing the field and laboratory data to develop appropriate geotechnical engineering design and construction recommendations

3.0 EXPLORATION PROCEDURES

3.1 Subsurface Exploration Procedures

3.1.1 Soil Test Borings

Sixteen electronic cone penetration test borings were performed during our field exploration. The three proposed parking borings (S-17, S-18 and S-19) were not performed due to not being on the project property. The cone penetration test sounding was performed in general conformance with ASTM D 5778 by our subcontractor. The soundings were performed with a track mounted rig. Measurements of in-situ shear wave velocities were obtained in the sounding for boring S-8. The approximate location of the CPT sounding is indicated on the CPT Location Diagram in Appendix A of this report.

The cone used in the sounding has a tip area of 15 cm^2 and a sleeve area of 225 cm^2 . The CPT soundings recorded tip resistance and sleeve friction measurements to assist in determining pertinent index and engineering properties of the site soils. The ratio of the sleeve friction to tip resistance is then used to aid in assessing the soil types through which the tip is advanced. Within the CPT sounding S-8, seismic tests were performed at approximately three foot intervals to select depths to measure the shear wave velocity (v_s) of the subsurface materials to aid in assessing the dynamic response properties of the site subsurface materials. The seismic shear waves are generated by making impact with a 20-pound sledgehammer onto a steel beam. The impacts are initiated on the right and left sides of the CPT rig and the corresponding wave traces recorded on an oscilloscope are analyzed to determine the shear wave velocity of the tested material. The waves are measured with three geophones that are installed in the cone. The results of the CPT and seismic testing are presented in Appendix B.

4.0 EXPLORATION RESULTS

4.1 Site Conditions

The proposed site is located off of Montford Point Road in Jacksonville, North Carolina. At the time of our field exploration, the site was wooded. Several ditches traverse the site. The site is relatively level.

4.2 Regional Geology

The site is located in the Coastal Plain Physiographic Province of North Carolina. The Coastal Plain is composed of seven terraces, each representing a former level of the Atlantic Ocean. Soils in this area generally consist of sedimentary materials transported from other areas by the ocean or rivers. These deposits vary in thickness from a thin veneer along the western edge of the region to more than 10,000 feet near the coast. The sedimentary deposits of the Coastal Plain rest upon consolidated rocks similar to those underlying the Piedmont and Mountain Physiographic Provinces. In general, shallow unconfined groundwater movement within the overlying soils is largely controlled by topographic gradients. Recharge occurs primarily by infiltration along higher elevations and typically discharges into streams or other surface water bodies. The elevation of the shallow water table is transient and can vary greatly with seasonal fluctuations in precipitation.

4.3 Soil Conditions

Soil Test Borings: Approximately 6 to 8 inches of organic topsoil was reported by the drillers at the boring locations. Beneath the surface to a depth of 30 feet, the test borings typically encountered intermittent layers of loose to very dense slightly silty, silty and clean sands (SP-SM, SM, SP) and soft to very stiff silts and clays (ML,MH, CL, CH). The equivalent corrected standard penetration test resistances (N^* -values) in these soils generally ranged from 3 to 67 blows per foot (bpf).

The descriptions provided in this section are a general summary of the subsurface conditions encountered within the CPT test borings. The CPT Boring Records in Appendix B contain detailed information recorded at each of the boring locations.

4.4 Groundwater Conditions

Groundwater observations were made after the completion of the drilling operations at all boring locations. Furthermore, visual observations of the samples retrieved during drilling exploration were also used in evaluating the groundwater conditions. The groundwater depths were observed to range from 2.4 to 7.4 feet below the existing grade after completion of the borings. The shallow ground water depths may be influenced by the presence of clays in the upper five feet.

The highest groundwater observations are normally encountered in the late winter and early spring, and our current groundwater observations are expected to be near or representative of the seasonal maximum water table. Variations in the location of the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, and other factors not immediately apparent at the time of this exploration. If long term water levels are crucial to the development of this site, it would be prudent to verify water levels with the use of perforated pipes or piezometers.

The relatively shallow groundwater conditions encountered within the boreholes are expected to impact utility excavations activities. However, this will depend on final site design grades. Consequently, the diversion of surface water should be expected in order to successfully complete site grading activities.

5.0 ANALYSIS AND RECOMMENDATIONS

The recommendations provided in this report are based upon our understanding of the proposed construction, the information provided to us during this study and our past experience with similar conditions. Should any of the information provided to us be changed prior to final design, ECS should be notified to review these recommendations and make appropriate revisions, if necessary.

5.1 Subgrade Preparation

The first step in preparing the site for the proposed construction should be to remove all vegetation, rootmat, topsoil, existing asphalt, existing foundations and utilities, deleterious materials, and any other soft or unsuitable materials from the existing ground surface. These operations should extend at least 10 feet, where possible, beyond the planned limits of the proposed building and pavements.

After proper clearing, stripping, grubbing, and prior to fill placement, foundation, slab, or pavement construction, the exposed subgrade soils should be carefully evaluated by an experienced geotechnical engineer to identify any localized unstable or otherwise unsuitable materials. After evaluating the exposed soils, proofrolling using a smooth drum vibratory roller, having an axle weight of at least 10 tons, is suggested to be used at this time to aid in identifying localized soft or unsuitable material which should be removed. The vibratory proofrolling will also densify the upper exposed subgrade soils and improve their load carrying capability. During this process, it may be necessary to allow groundwater brought to the surface during densification to recede prior to continued densification or subsequent fill placement. Any soft or unsuitable materials identified during proofrolling operations should be either repaired in-place or removed and replaced with an approved backfill placed and compacted in accordance with recommendations of this report. Undercutting may be required in some of the footing locations. The footing subgrade should be checked following footing excavations to determine if undercutting is required.

Site subgrade conditions will be significantly influenced by weather conditions. Subgrades that are evaluated after periods of rainfall will not respond as well to proofrolling as subgrades that are evaluated after periods of more favorable weather. We strongly recommend that rubber tire equipment not be used if subgrade conditions exhibit elevated moisture conditions. The contractor should use tracked equipment to minimize the degradation of marginally stable subgrade.

The preparation of fill subgrades, as well as proposed building subgrades, should be observed on a full-time basis by a representative of ECS. These observations should be performed by an experienced geotechnical engineer, or his representative, to ensure that all unsuitable materials have been removed and that the prepared subgrade is suitable for support of the proposed construction and/or fills.

5.2 Engineered Fill Placement

Following the removal of deleterious surface and subsurface materials, and after achieving a stable subgrade, engineered fills can be placed and compacted to achieve the desired site grades. All fill for support of the proposed construction and for backfill of utility lines within expanded building and pavement limits should consist of an approved material, free of organic matter and debris and cobbles greater than 3 inches, and have a Liquid Limit (LL) and Plasticity Index (PI) less than 40 and 20, respectively. We also recommend that all fills within structural areas have a standard Proctor (ASTM D 698) maximum dry density of at least 110 pounds per cubic foot (pcf).

Unsuitable fill materials include topsoil, organic materials (OH, OL), and high plasticity clays and silts (CH, MH). All such materials removed during grading operations should be either stockpiled for later use in landscape fills, or placed in approved on or off-site disposal areas.

Existing soils containing significant amounts of organic matter will not be suitable for re-use as engineered fill. As such, the organic content of the near surface cultivated soils should be evaluated to determine if some of these soils will be suitable for re-use as engineered fill. Natural fine-grained soils classified as clays or silts (CL, ML) with LL and PI greater than 40 and 20, respectively, should be evaluated by the geotechnical engineer at the time of construction to determine their suitability for use as engineered fill.

Prior to the commencement of fill operations and/or utilization of any off-site borrow materials, the contractor should provide representative samples of the proposed fill soils to the geotechnical engineer. The geotechnical engineer can determine the material's suitability for use as an engineered fill and develop moisture-density relationships in accordance with the recommendations provided herein. Samples should be provided to the geotechnical engineer at least 3 to 5 days prior to their use in the field to allow for the appropriate laboratory testing to be performed.

Fill materials placed within the building and pavement areas should be placed in lifts not exceeding 8 inches in loose lift thickness and moisture conditioned to within their working range of optimum moisture content. The fills should then be compacted to a minimum of 95 percent of the soil's standard Proctor (ASTM D 698) maximum dry density to within 12 inches below finished subgrade. The upper 12 inches of fills placed beneath structural development should be compacted to 98 percent of the soil's standard Proctor maximum dry density. The typical working range of optimum moisture for the natural Coastal Plain soils at the site is expected to be within approximately 3 percent of the optimum moisture content. Care should also be taken to provide a smooth, gently sloping ground surface at the end of each day's earthwork activities to help reduce the potential for ponding and absorption of surface water.

Grade controls should also be maintained throughout the filling operations. All filling operations should be observed on a full-time basis by a qualified representative of ECS to determine that the required degrees of compaction are being achieved. We recommend that a minimum of one compaction test per 2,000-square-foot area be performed for each lift of controlled fill. The elevation and location of the tests should be clearly identified at the time of fill placement. Areas which fail to achieve the required degree of compaction should be re-worked until the specified degree of compaction is achieved. Failing test areas may require moisture adjustments or other suitable remedial activities in order to achieve the required compaction.

Fill materials should not be placed on frozen, frost-heaved, and/or soils which have been recently subjected to precipitation. All wet or frozen soils should be removed prior to the continuation of site grading and fill placement. Borrow fill materials, if required, should not contain excessively wet or frozen materials at the time of placement. Additionally, if grading operations occur during the winter months, all frost-heaved soils should be removed prior to placement of engineered fill, granular sub-base materials, foundation or slab concrete, and asphalt pavement materials.

If problems are encountered during the site grading operations, or if the actual site conditions differ from those encountered during our subsurface exploration, the geotechnical engineer should be notified immediately.

5.3 Foundation Design

Provided the subgrade preparation and earthwork operations are completed in strict accordance with the recommendations of this report, the proposed construction can be supported on conventional shallow foundations bearing on approved natural materials and/or properly compacted fill. We recommended a net allowable design soil bearing pressure of 2,000 psf for proportioning continuous and isolated column footings. To reduce the possibility of foundation bearing failure and excessive settlement due to local shear or "punching" failures, we recommend that continuous footings have a minimum width of 18 inches and that isolated column footings have a minimum lateral dimension of 30 inches. Furthermore, all footings should bear at a depth to provide adequate frost cover protection. For this region, we recommend the bearing elevation be a minimum depth of 12 inches below the finished exterior grade or in accordance with the local building code requirements. We request the opportunity to review our recommendations once structural loads and site design grades are determined.

The net allowable soil bearing pressure refers to that pressure which may be transmitted to the foundation bearing soils in excess of the final minimum surrounding overburden pressure. The final footing elevation should be evaluated by ECS personnel to verify that the bearing soils are capable of supporting the recommended net allowable bearing pressure and suitable for foundation construction. These evaluations should include visual observations, hand rod probing, and dynamic cone penetrometer (ASTM STP 399) testing, or other methods deemed appropriate by the geotechnical engineer at the time of construction, in each column footing excavation and at intervals not greater than 20 feet in continuous footing excavations.

The settlement of a structure is a function of the compressibility of the bearing materials, bearing pressure, actual structural loads, fill depths, and the bearing elevation of footings with respect to the final ground surface elevation. Estimates of settlement for foundations bearing on engineered or non-engineered fills are strongly dependent on the quality of fill placed. Factors which may affect the quality of fill include maximum loose lift thickness of the fills placed and the amount of compactive effort placed on each lift. Provided the recommendations outlined in this report are strictly adhered to, we expect that total settlements for the proposed construction are expected to be in the range of 1 inch or less, while the differential settlement will be approximately $\frac{1}{2}$ of the anticipated total settlement. This evaluation is based on our engineering experience and anticipated structural loadings for this type of structure, and is intended to aid the structural engineer with his design. We request the opportunity to review our recommendations once structural loads are determined.

5.4 Seismic Site Class Determination and Liquefaction Potential

The 2006 North Carolina Building Code has adopted the 2003 Edition of the International Building Code (IBC) with North Carolina Amendments, which requires that a seismic Site Class be assigned for new structures. The seismic Site Class for the site was determined by calculating a weighted average of the shear velocities of the overburden to the depth of rock/refusal. The CPT test data indicates that the existing natural, overburden soils at the site have shear velocities ranging from approximately 538.9 to 1,448.4 feet per second (ft/s). The method for determining the weighted average value is presented in Section 1615.1.5 of the IBC 2003. The weighted average value for the site is 1,123.8 ft/s. Based on the results of the CPT soundings and our evaluation of the site, the site has a seismic classification "D".

The potential for liquefaction at the site is considered low based upon the CPT results, borings and laboratory test results, and procedures developed by Seed and Idriss. Based on our CPT results and our evaluation using a site specific peak ground acceleration of 0.12g and an earthquake event with a magnitude of 7.3, the liquefaction induced settlement at the subject site is less than one inch.

5.5 Floor Slab Design

Provided a suitable subgrade will be prepared as recommended herein, ground level slabs can be designed as slabs-on-grade. Our findings indicate that a modulus of subgrade reaction (k_s) of 150 pci is appropriate for design, provided that the upper 12 inches of the slab subgrade soils have been uniformly compacted to at least 98 percent of their standard Proctor maximum dry density.

We recommend that all slabs-on-grade be isolated from the foundations so that potential differential settlement of the structure will not induce shear stresses in the floor slab. Also, to minimize the crack width of any shrinkage cracks that may develop near the surface of the slab, wire mesh reinforcement may be included in the slab design. The mesh should be located in the top third of the slab to be effective.

We also recommend that all slabs-on-grade be underlain by a minimum of 4 inches of open graded aggregate to help prevent the capillary rise of subsurface moisture from adversely affecting the slab. If open graded aggregate is not available, clean sand with less than 3 percent fines can be used provided the placement and compaction of the sand complies with the above recommendations. If floor covering such as tile or carpet will be utilized for interior finishes, a polyethylene vapor barrier may be used beneath the floor slab for moisture control considerations.

5.6 Lateral Earth Pressures

Any below-grade walls utilized for this project should be designed to withstand the lateral earth pressures exerted upon them. In the design of below-grade retaining walls to restrain in-situ natural soils, the following soil parameters can be utilized as determined using Rakine's Method:

Soil Property	Clean Sand	Slightly Silty Sand & Silty Sand	Clay Approximate Depth
Coefficient of Active Earth Pressure	0.31	0.36	0.70
Coefficient of Passive Earth Pressure	3.22	2.77	1.43
Coefficient of At Rest Earth Pressure	0.47	0.53	0.55
Friction Angle for Soil	32 degrees	28 degrees	10 degrees
Cohesion for Soil	0 psf	0 psf	250 psf
Effective Unit Weight (below water table)	80 pcf	70 pcf	53 pcf

These recommendations have assumed that the wall will have no surcharge loads. The increased lateral pressures generated by surcharge loads (i.e. slopes, parking and building areas, etc.) should be considered in the design.

For wall conditions where wall movement cannot be tolerated or where the wall is restrained at the top, the "At Rest" earth pressure should be used. For wall conditions where outward wall movement in the range of 0.5 to 1 percent of the wall height can be tolerated, the "Active" earth pressure should be used. In evaluating the resistance of soil to lateral loads imposed by structures, the "Passive" earth pressure should be used. Please note that the full development of passive pressure requires deflections toward the soil mass on the order of 1 to 4 percent of the wall height. Furthermore, the passive contribution within the zone of frost penetration (36 inches) should be neglected.

5.7 Pavement Design Considerations

For the design and construction of exterior pavements, the subgrades should be prepared in strict accordance with the recommendations in the "Subgrade Preparation" and "Engineered Fill Placement" sections of this report. An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should minimize the possibility of the subgrade materials becoming saturated during the normal service period of the pavement.

For pavements at the site, 2 inches of surface SF9.5 mix overlying six inches of compacted crushed stone in the light pedestrian type vehicle areas and 1.5 inches of surface SF9.5 mix over 2.5 inches of H19.0 mix overlying eight inches of compacted crushed stone in the main heavily traveled drive areas, in truck delivery and dumpster areas. In lieu of compacted crushed stone for heavily traveled drive areas, 5 inches of B25.0 mix can be used.

Regardless of the section and type of construction utilized, saturation of the subgrade materials and asphalt pavement areas results in a softening of the subgrade material and shortened life span for the pavement. Therefore, we recommend that both the surface and subsurface materials for the pavement be properly graded to enhance surface and subgrade drainage. By quickly removing surface and subsurface water, softening of the subgrade can be reduced and the performance of the parking area can be improved. Site preparation for the parking areas should be similar to that for the building area including stripping, proofrolling, and the placement of compacted structural fill.

Please note that large, front-loading trash dumpsters frequently impose concentrated front-wheel loads on pavements during loading. This type of loading typically results in rutting of bituminous pavements and ultimately pavement failures and costly repairs. Consequently, we recommend the use of an eight inch thick, mesh reinforced concrete slab that extends the entire length of the truck. Concrete pavements should be properly jointed and reinforced as needed to help reduce the potential for cracking and to permit proper load transfer.

5.8 Site Drainage

Positive drainage should be provided around the perimeter of the structure to minimize the potential for moisture infiltration into the foundation and slab subgrade soils. We recommend that landscaped areas adjacent to these structures be sloped away from the construction and maintain a fall of at least 6 inches for the first 10 feet outward from the structures. The parking lots, sidewalks, and any other paved areas should also be sloped to divert surface water away from the proposed building.

The proper diversion of surface water during site grading and construction will help reduce the potential for delays associated with periods of inclement weather. The proper diversion of surface water is especially critical since portions of the site soils are expected to be moisture sensitive. Based upon our past experience, the use of "crowning" large areas of exposed soils should be useful to help divert surface water from the prepared subgrades.

5.9 Construction Considerations

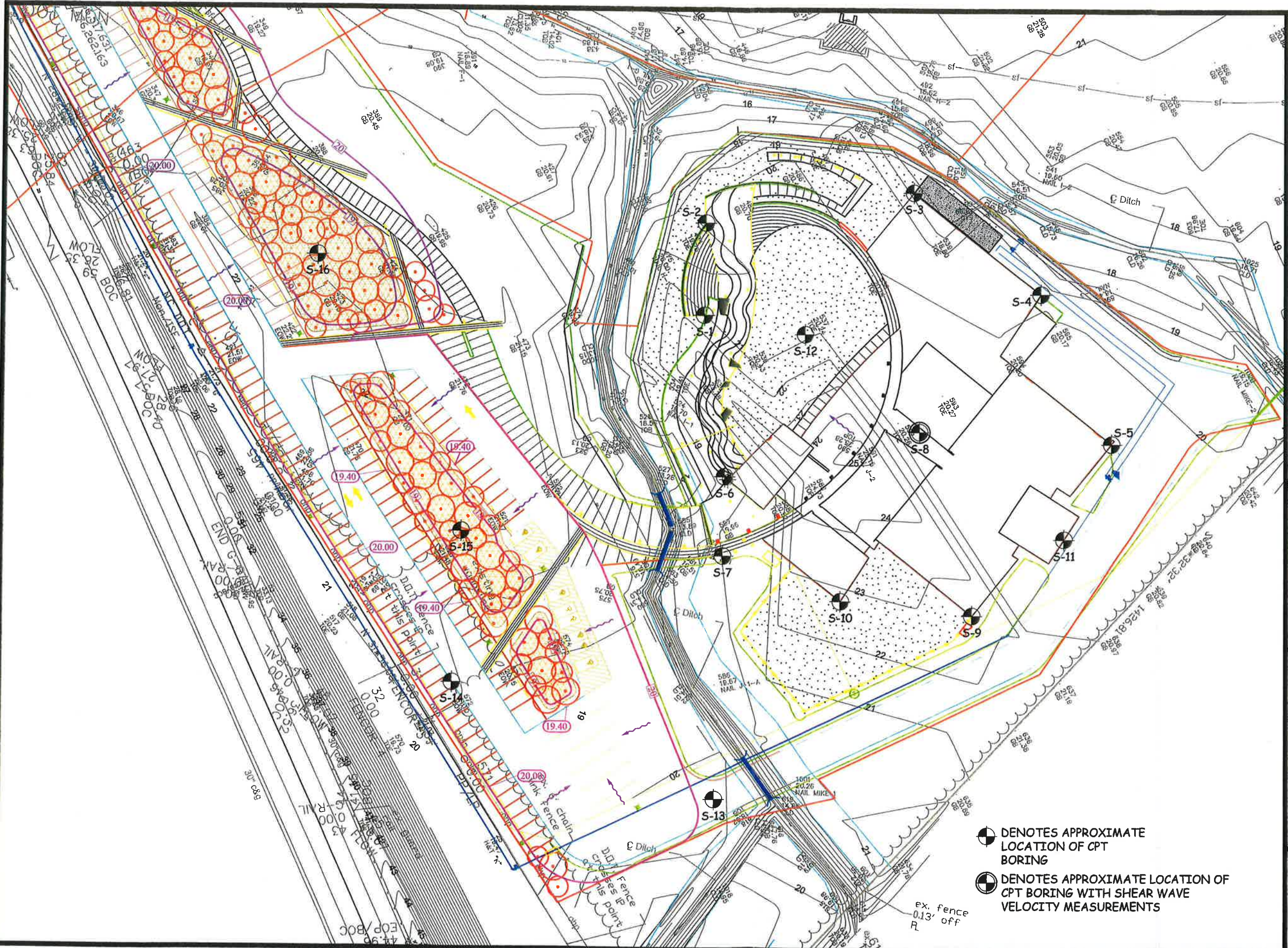
Exposure to the environment may weaken the soils at the foundation bearing elevation if the foundation excavations remain exposed during periods of inclement weather. Therefore, foundation concrete should be placed the same day that proper excavation is achieved and the design bearing pressure verified. If the bearing soils are softened by surface water absorption or exposure to the environment, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if inclement weather becomes imminent while the bearing soils are exposed, we recommend that a 1 to 3 inch thick "mud-mat" of "lean" concrete be placed over the exposed bearing soils before the placement of reinforcing steel.

It is imperative to maintain good site drainage during earthwork operations to help maintain the integrity of the surface soils. The surface of the site should be kept properly graded to enhance drainage of surface water away from the proposed construction areas during the earthwork phase of this project. We recommend that surface drainage be diverted away from the proposed building and pavements areas without significantly interrupting its flow. Other practices would involve sealing the exposed soils daily with a smooth-drum roller at the end of the day's work to reduce the potential for infiltration of surface water into the exposed soils.

The key to minimizing disturbance problems with the soils is to have proper control of the earthwork operations. Specifically, it should be the earthwork contractor's responsibility to maintain the site soils within a workable moisture content range to obtain the required in-place density and maintain a stable subgrade. Scarifying and drying operations should be included in the contractor's price and not be considered an extra to the contract. In addition, construction equipment cannot be permitted to randomly run across the site, especially once the desired final grades have been established. Construction equipment should be limited to designated lanes and areas, especially during wet periods to minimize disturbance of the site subgrades. It will likely be necessary to utilize tracked equipment during grading operations particularly if the subgrade soils exhibit elevated moisture conditions.

6.0 CLOSING

Our geotechnical evaluation of the site has been based on our understanding of the site, the project information provided to us, and the data obtained during our exploration. The general subsurface conditions utilized in our evaluations have been based on interpolation of subsurface data between the borings. If the project information provided to us is changed, please contact us so that our recommendations can be reviewed and appropriate revisions provided, if necessary. The discovery of any site or subsurface conditions during construction which deviate from the data outlined in this exploration should be reported to us for our evaluation. The assessment of site environmental conditions for the presence of pollutants in the soil and groundwater of the site was beyond the scope of this geotechnical exploration.



NOT TO SCALE

REFERENCE:

SITE MAP PROVIDED BY
CALLOWAY JOHNSON MOORE &
WEST, P.A.



FIGURE 1

SITE MAP
MARINE CORPS MUSEUM OF THE
CAROLINAS
ONSLow COUNTY
JACKSONVILLE, NORTH CAROLINA

PROJECT NO. 22-13112

DRAWN BY/DATE
WEG/09-06-07
CHECKED BY/DATE
WEG 9/20/07
FILENAME: SITEMAP

APPENDIX B

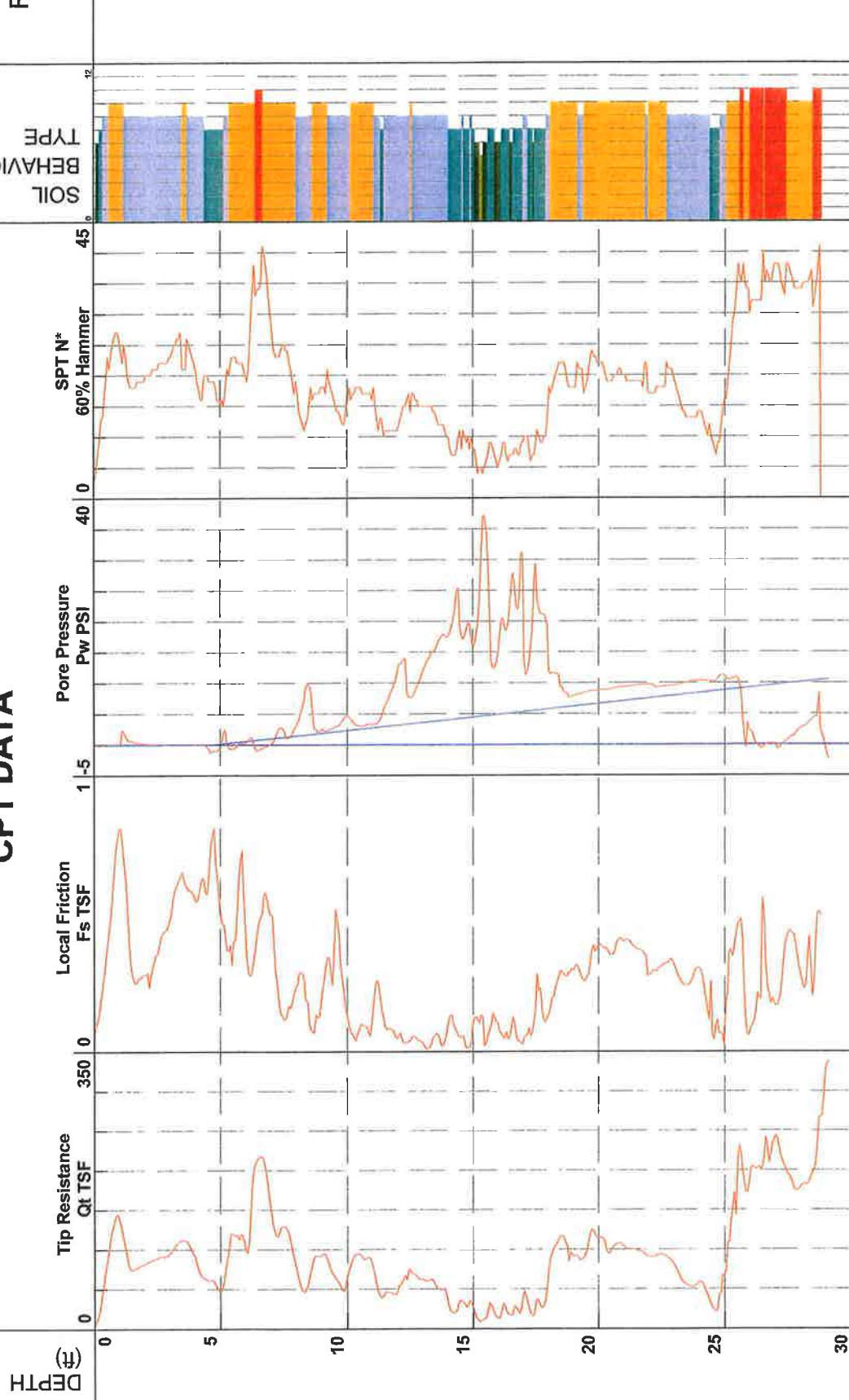
CPT BORING LOGS AND SEISMIC SHEAR WAVE VELOCITY DATA



Marine Corps Museum of the Carolinas

Operator	Ron Stewart	Cone Number	DSA0866	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/7/2007 8:08:07 AM	Hole Number	S-1
Water Table	4.66 ft	GPS Location	3444.7556N, 07724.7680W	County	Onslow

CPT DATA



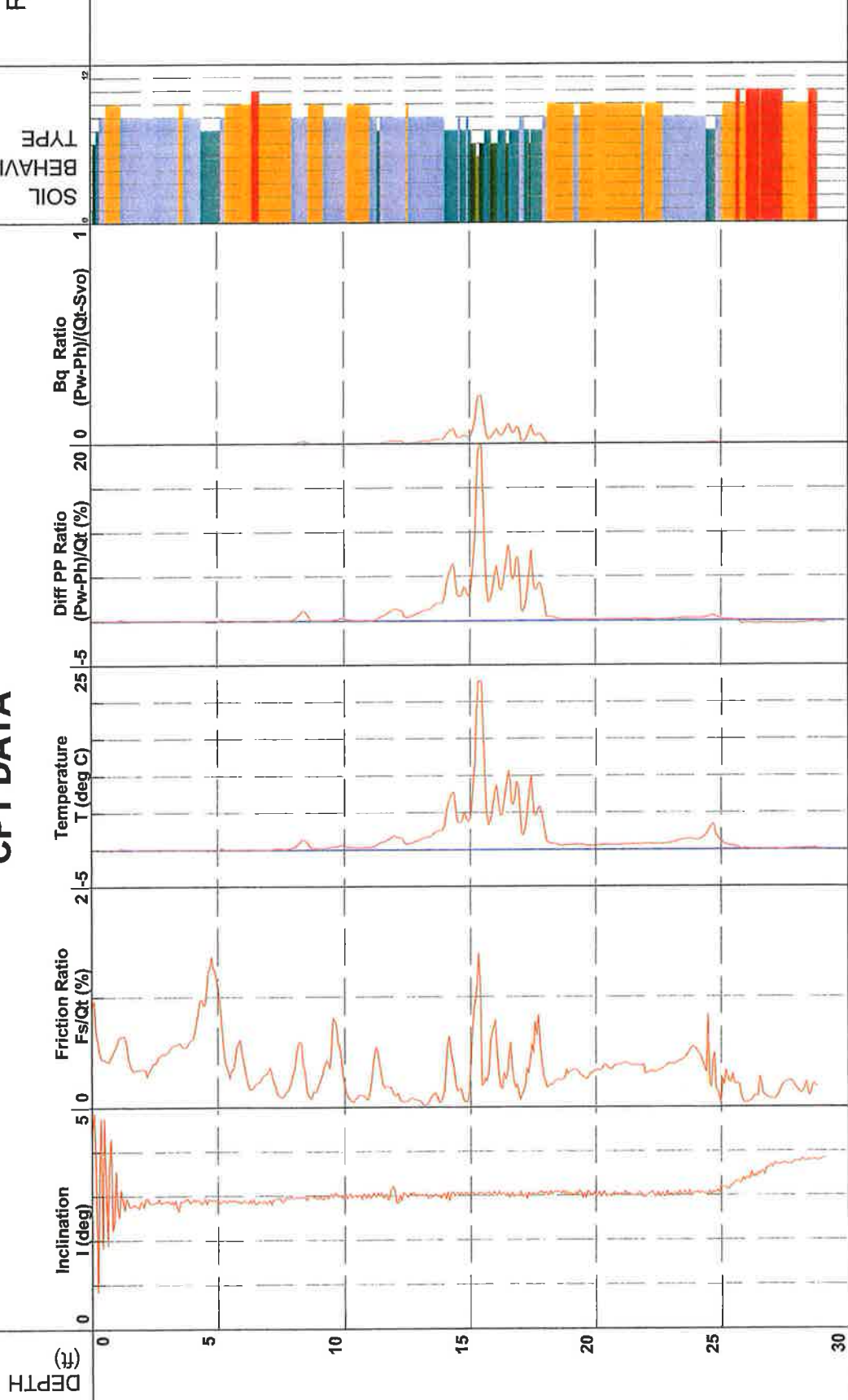
- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Ron Stewart	Cone Number	DSA0866	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/7/2007 8:08:07 AM	Hole Number	S-1
Water Table	4.66 ft	GPS Location	3444.7556N, 07724.7680W	County	Onslow

CPT DATA

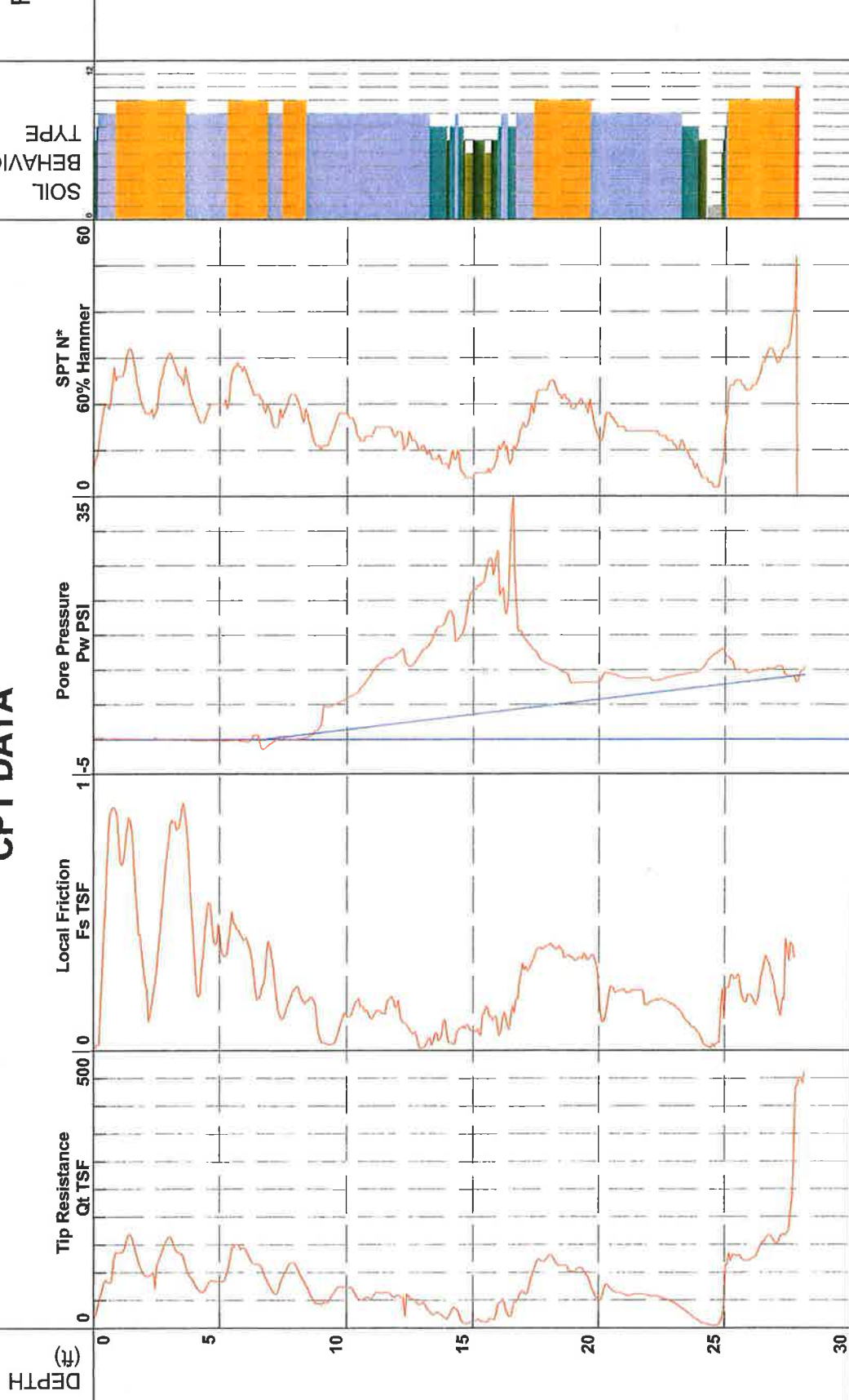




Marine Corps Museum of the Carolinas

Operator	Conc Number	Location
Job Number	Date and Time	Hole Number
Water Table	GPS Location	County
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	3444.7678N, 07724.7685W	Onslow

CPT DATA



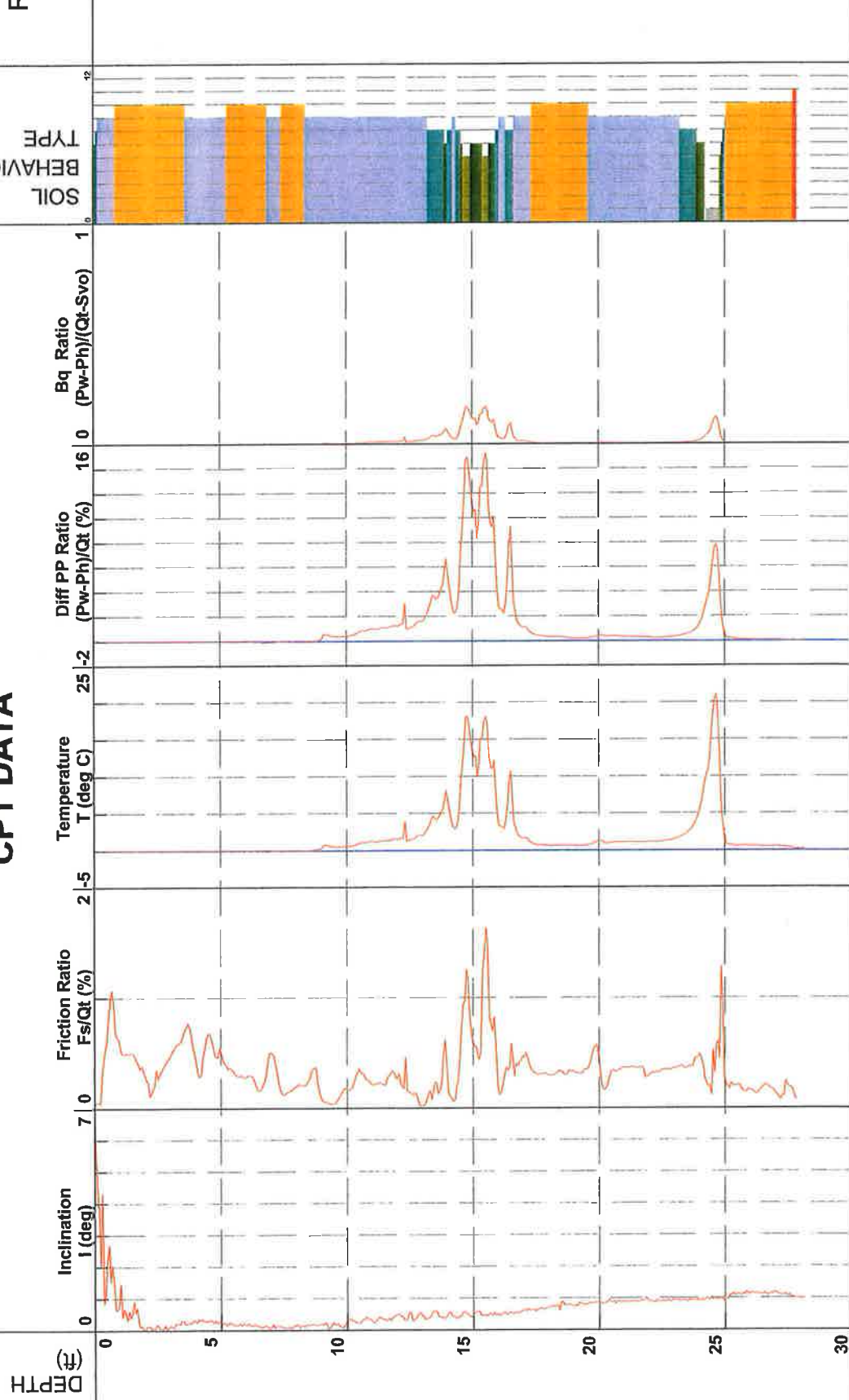
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- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Cone Number	Location
Ron Stewart	DSA0866	Jacksonville, North Carolina
Job Number	Date and Time	Hole Number
22-13112	9/7/2007 9:44:41 AM	S-2
Water Table	GPS Location	County
6.76 ft	3444.7678N, 07724.7685W	Onslow

CPT DATA



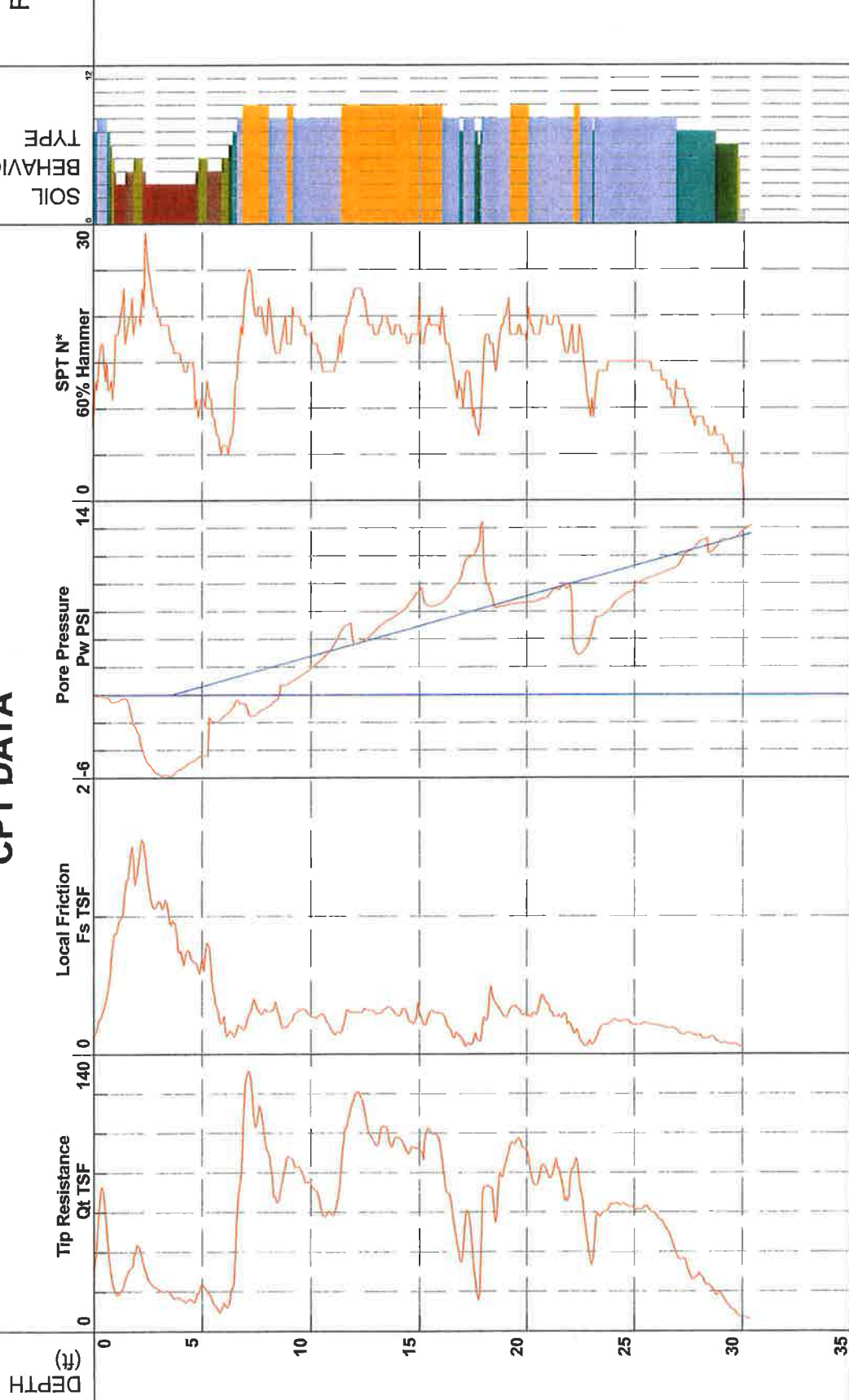
- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty clay to clay
- 8 - silty sand to sandy silt
- 9 - sand to silty sand
- 10 - sandy silt to clayey silt
- 11 - silty sand to sandy silt
- 12 - sand to silty sand
- 13 - silty clay to clay
- 14 - clayey silt to silty clay
- 15 - sandy silt to clayey silt
- 16 - silty sand to sandy silt
- 17 - sand to silty sand
- 18 - silty clay to clay
- 19 - clayey silt to silty clay
- 20 - sandy silt to clayey silt
- 21 - silty sand to sandy silt
- 22 - sand to silty sand
- 23 - silty clay to clay
- 24 - clayey silt to silty clay
- 25 - sandy silt to clayey silt
- 26 - silty sand to sandy silt
- 27 - sand to silty sand
- 28 - silty clay to clay
- 29 - clayey silt to silty clay
- 30 - sandy silt to clayey silt



Marine Corps Museum of the Carolinas

Operator	Ron Stewart	Cone Number	DSA0866	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/7/2007 10:10:48 AM	Hole Number	S-3
Water Table	3.61 ft	GPS Location	3444.7750N, 07724.7517W	County	Onslow

CPT DATA



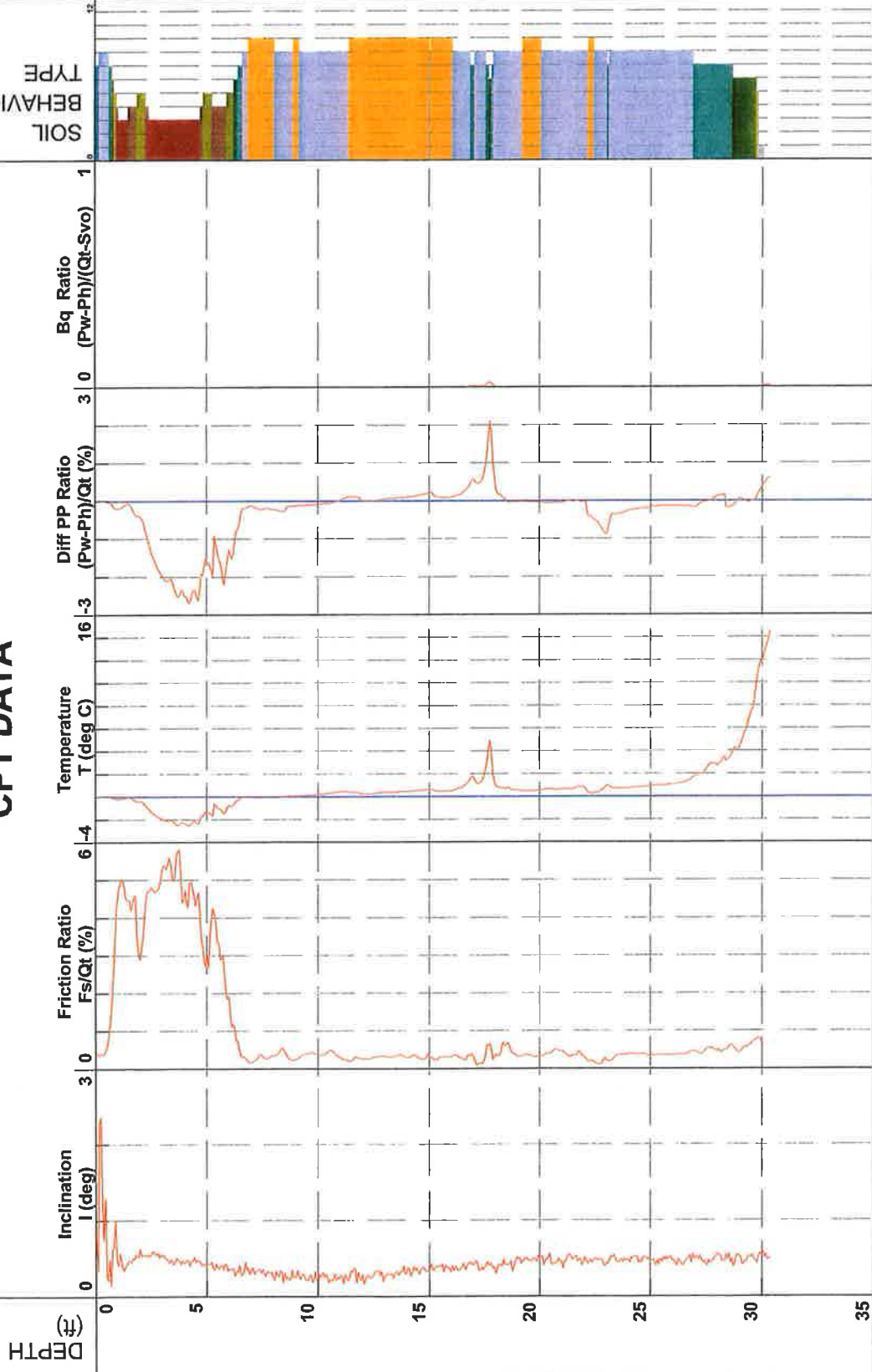
1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Ron Stewart	Cone Number	DSA0866	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/7/2007 10:10:48 AM	Hole Number	S-3
Water Table	3.61 ft	GPS Location	3444.7750N, 07724.7517W	County	Onslow

CPT DATA



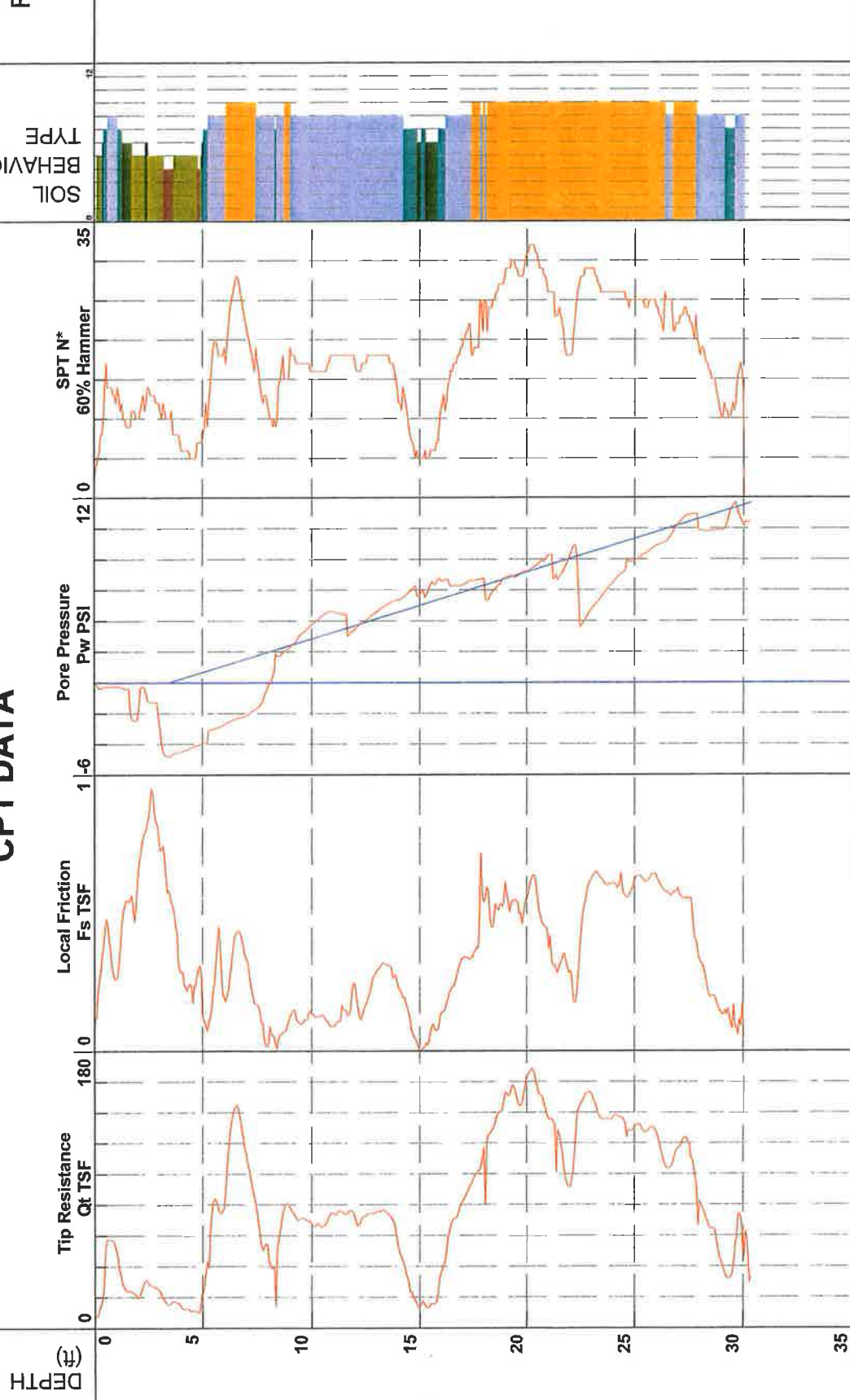
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- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Cone Number	Location
Job Number	Date and Time	Hole Number
Water Table	GPS Location	County
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	9/7/2007 10:39:55 AM	S-4
	3444.7578N, 07724.7298W	Onslow

CPT DATA



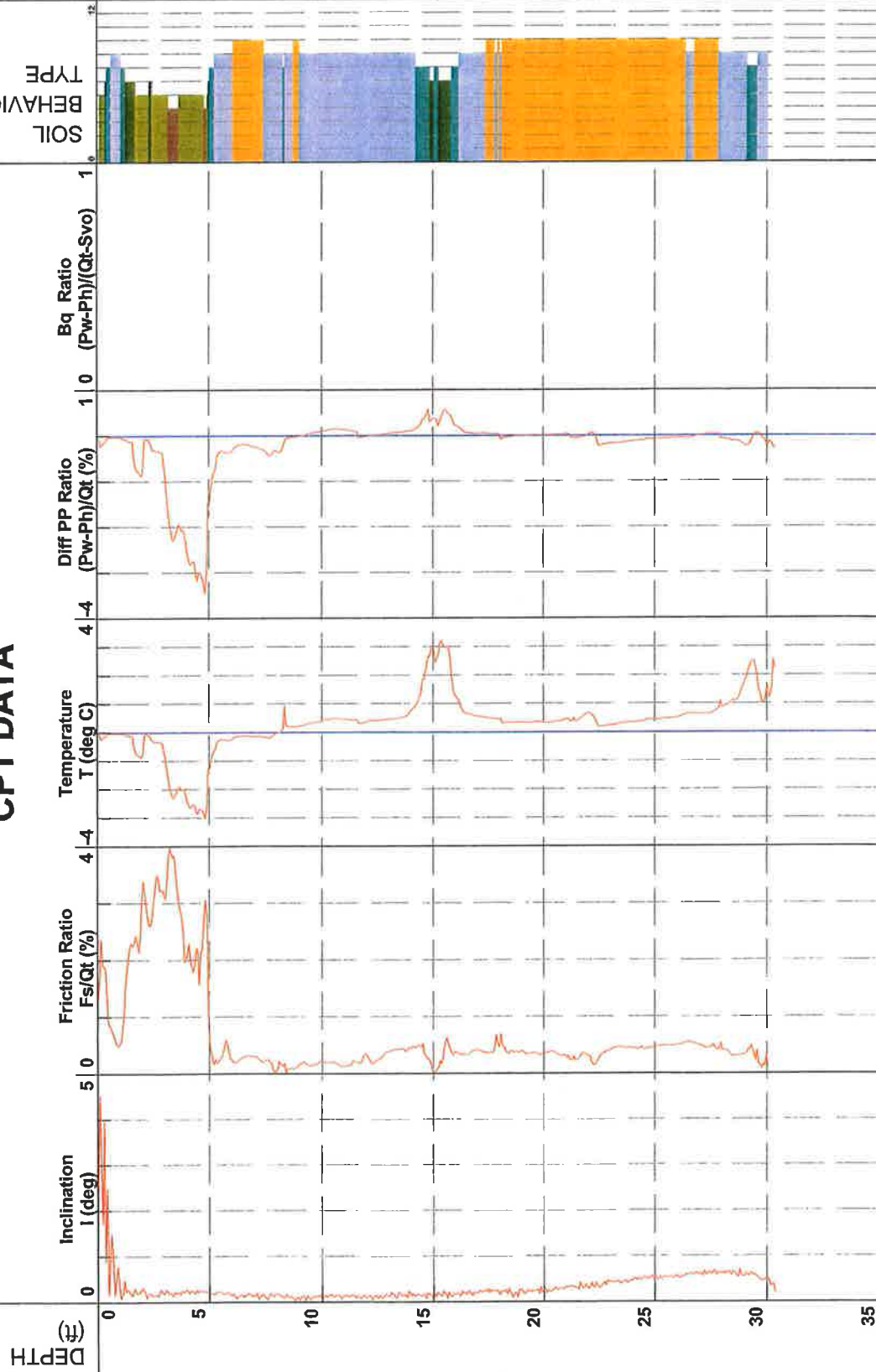
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- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Cone Number	Location
Ron Stewart	DSA0866	Jacksonville, North Carolina
Job Number	Date and Time	Hole Number
Water Table	22-13112	S-4
	3.48 ft	Onslow
	GPS Location	
	3444.7578N, 07724.7298W	

CPT DATA



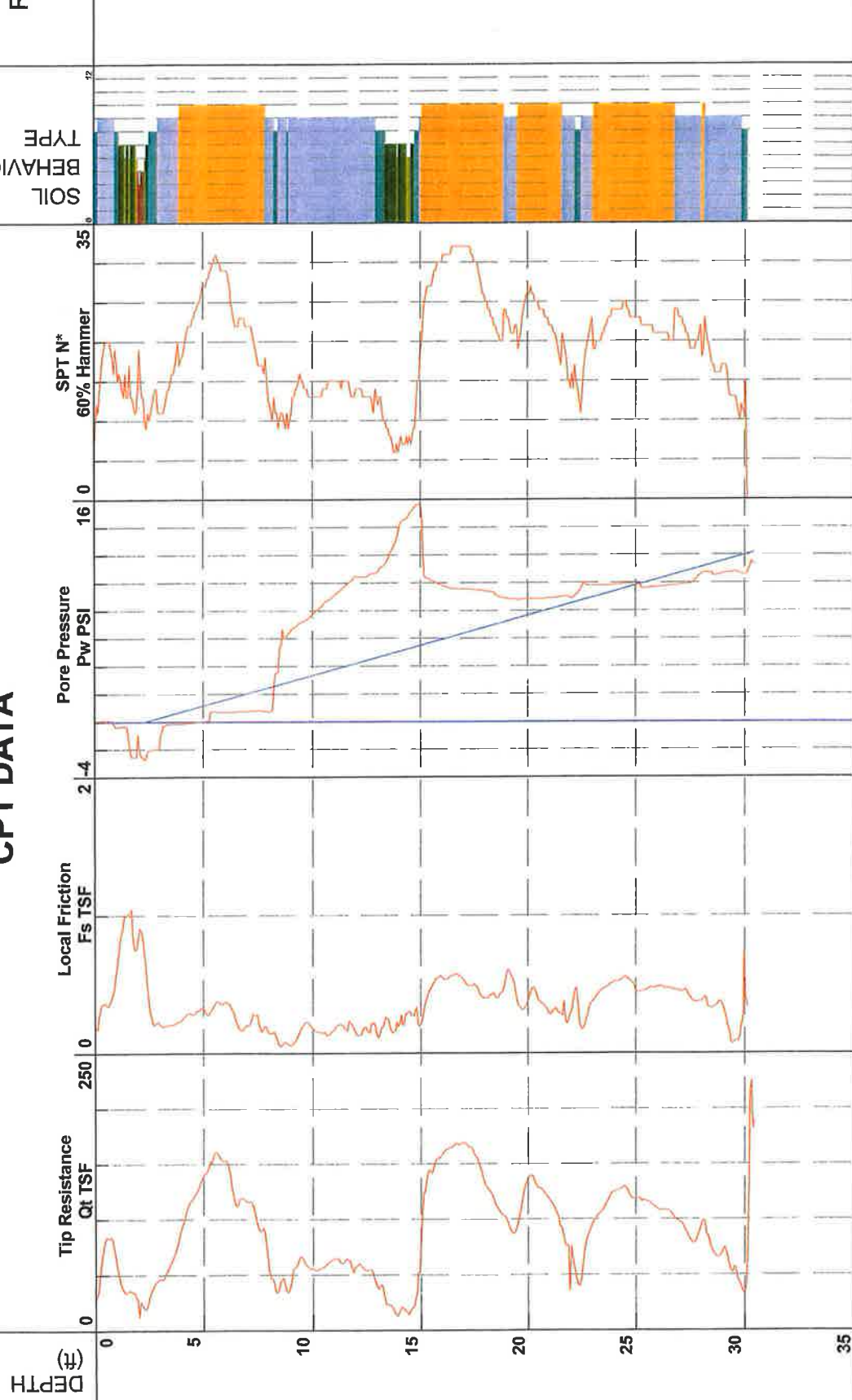
REMARKS



Marine Corps Museum of the Carolinas

Operator	Job Number	Water Table
Ron Stewart	22-13112	2.36 ft
Cone Number	Date and Time	GPS Location
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Location	Hole Number	County
Jacksonville, North Carolina	S-5	Onslow

CPT DATA



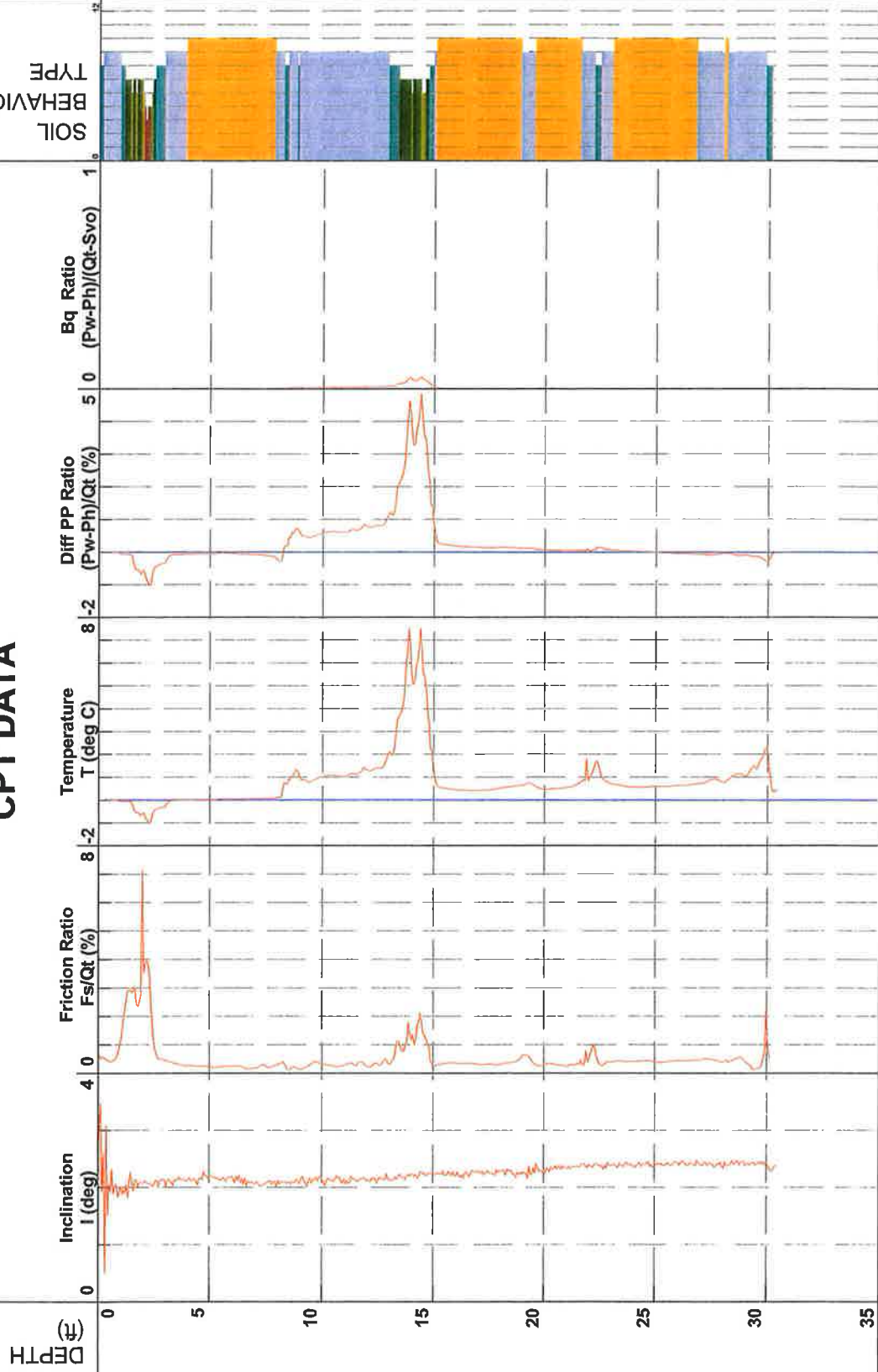
REMARKS



Marine Corps Museum of the Carolinas

Operator	Ron Stewart	Cone Number	DSA0866	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/7/2007 11:14:26 AM	Hole Number	S-5
Water Table	2.36 ft	GPS Location	3444.7400N, 07724.7106W	County	Onslow

CPT DATA



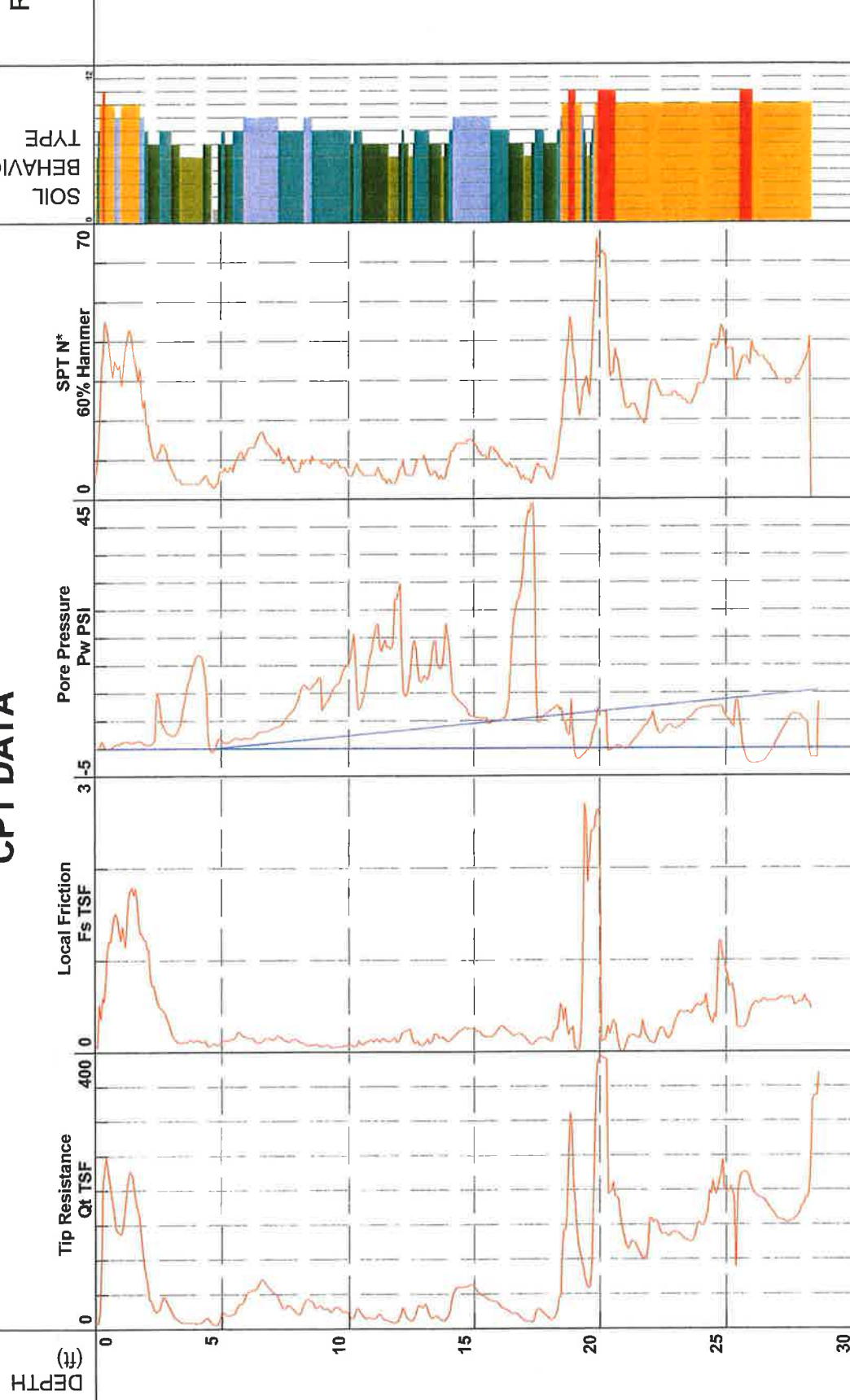
REMARKS



Marine Corps Museum of the Carolinas

Operator	Ron Stewart	Cone Number	DSG0867	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/10/2007 9:36:39 AM	Hole Number	S-6
Water Table	4.66 ft	GPS Location	3444.7344N, 07724.7695W	County	Onslow

CPT DATA



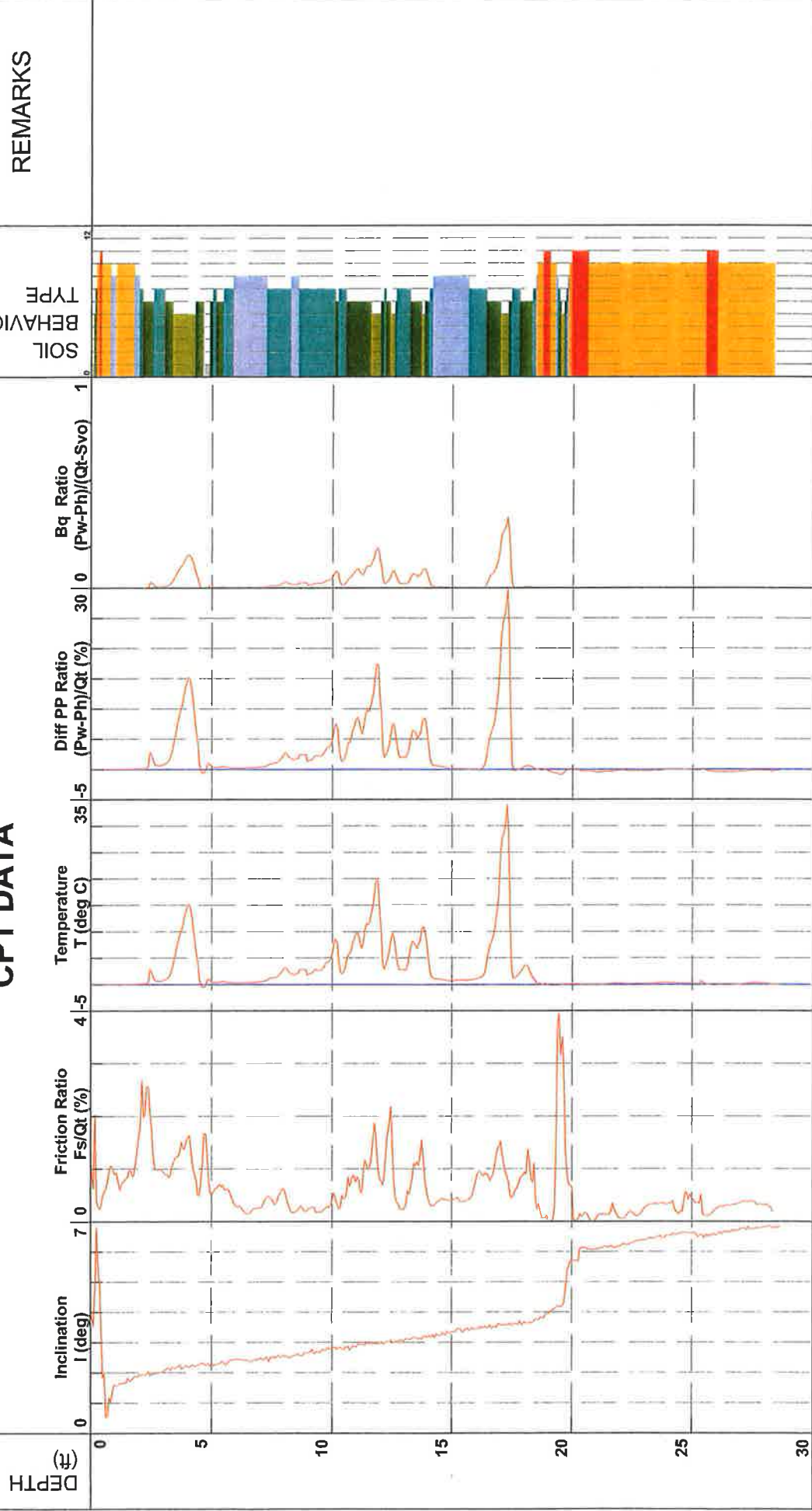
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2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Ron Stewart	Cone Number	DSG0867	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/10/2007 9:36:39 AM	Hole Number	S-6
Water Table	4.66 ft	GPS Location	3444.7344N, 07724.7695W	County	Onslow

CPT DATA



1 - sensitive fine grained	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	9 - sand	12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator
Job Number
Water Table

Ron Stewart
22-13112
6.30 ft

Cone Number
Date and Time
GPS Location

DSG0867
9/10/2007 9:09:06 AM
3444.7319N, 07724.7735W

Location
Hole Number
County

Jacksonville, North Carolina
S-7
Onslow

CPT DATA

DEPTH (ft)

Tip Resistance
Qt TSF

350

0

Local Friction
Fs TSF

1

-5

Pore Pressure
Pw PSI

45

0

SPT N*
60% Hammer

50

0

SOIL
BEHAVIOR
TYPE

REMARKS

1 - sensitive fine grained

2 - organic material

3 - clay

4 - silty clay to clay

5 - clayey silt to silty clay

6 - sandy silt to clayey silt

7 - silty sand to sandy silt

8 - sand to silty sand

9 - sand

10 - gravelly sand to sand

11 - very stiff fine grained (*)

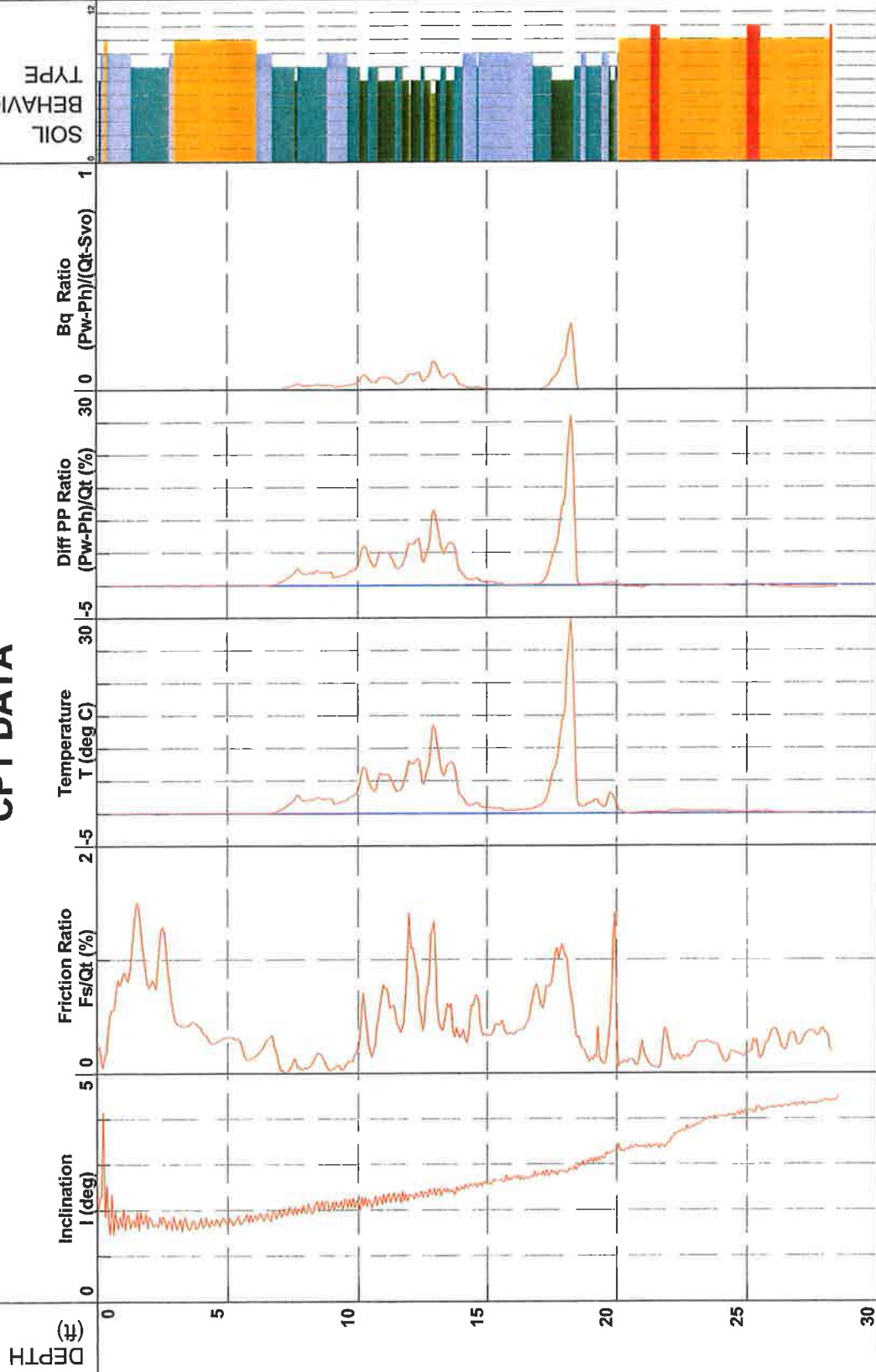
12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Ron Stewart	Cone Number	DSG0867	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/10/2007 9:09:06 AM	Hole Number	S-7
Water Table	6.30 ft	GPS Location	3444.7319N, 07724.7735W	County	Onslow

CPT DATA



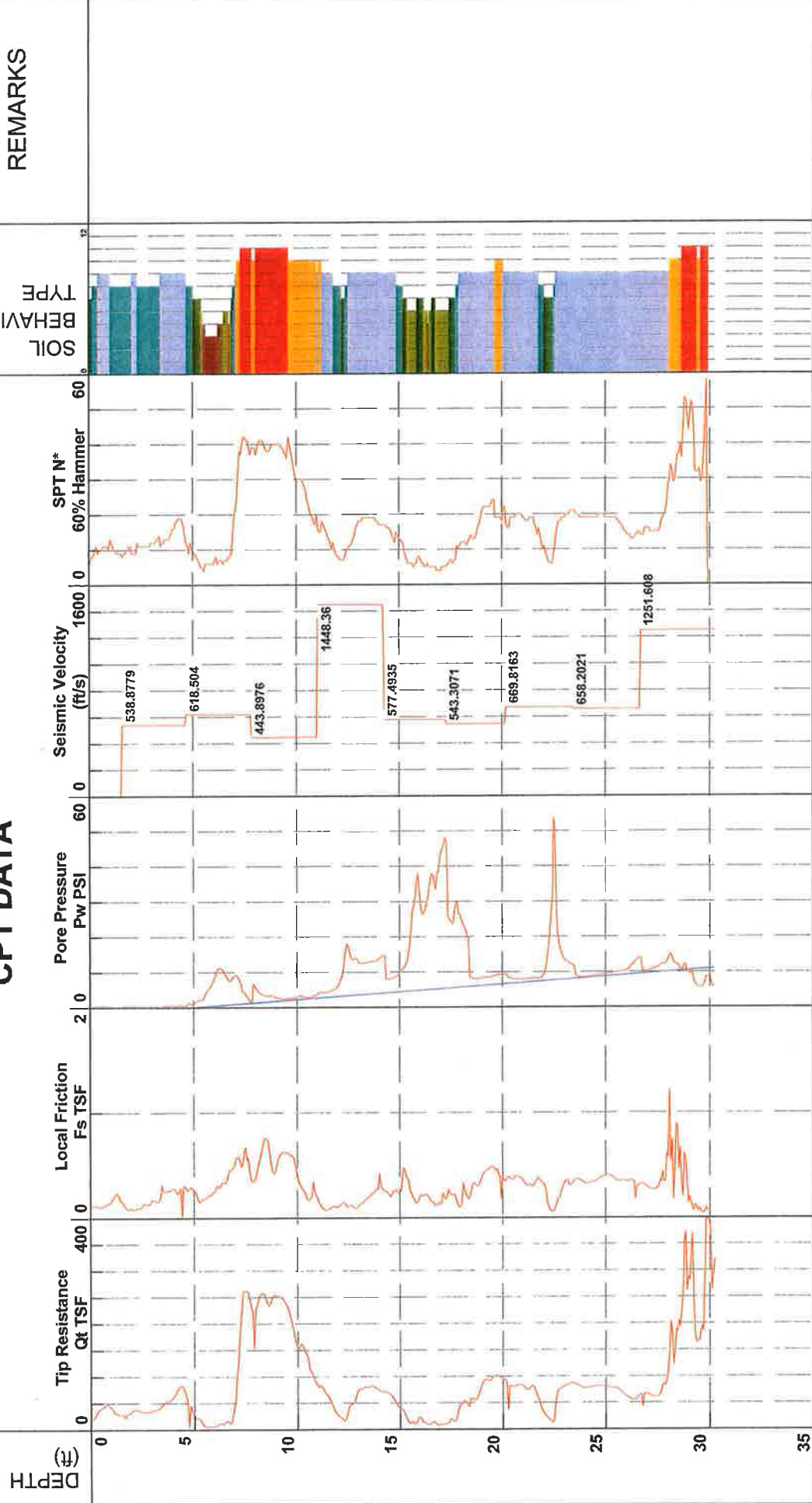
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- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Ron Stewart	Cone Number	DSG0867	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/10/2007 7:36:11 AM	Hole Number	S-8
Water Table	4.79 ft		3444.7245N, 07724.7371W	County	Onslow

CPT DATA

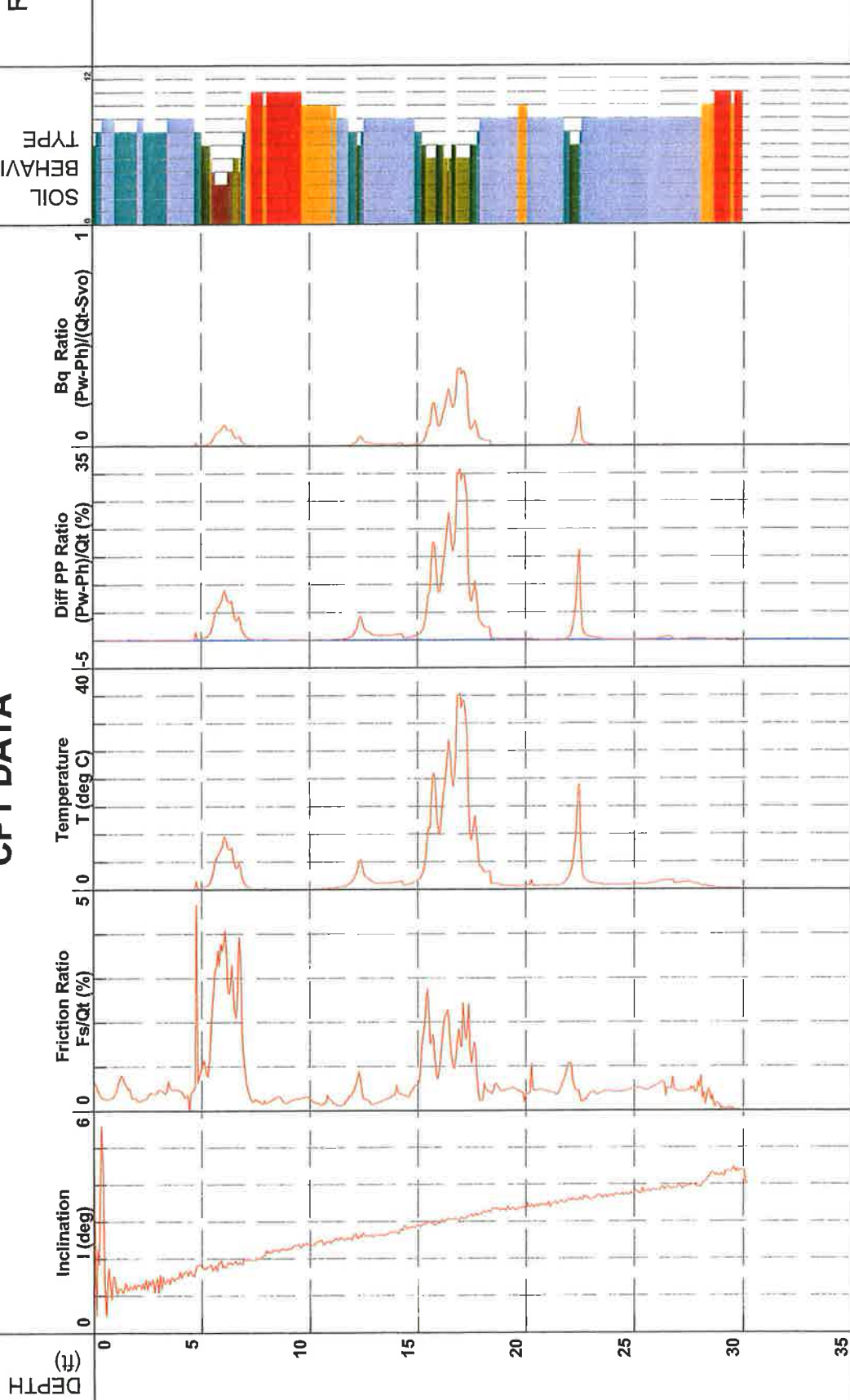




Marine Corps Museum of the Carolinas

Operator	Ron Stewart	Cone Number	DSG0867	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/10/2007 7:36:11 AM	Hole Number	S-8
Water Table	4.79 ft	GPS Location	3444.7245N, 07724.7371W	County	Onslow

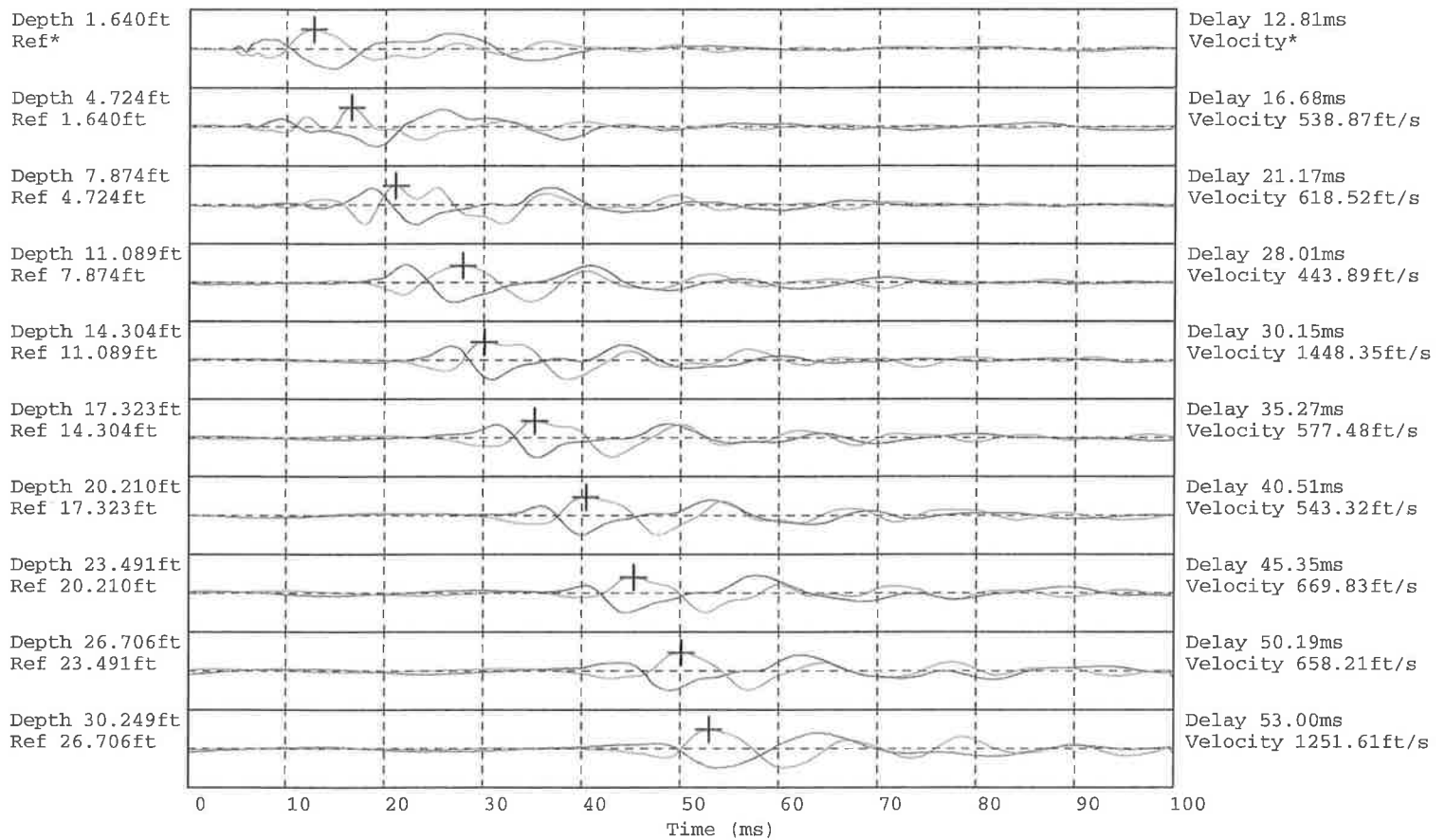
CPT DATA



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Marine Corps Museum of the Carolinas

S-8



Hammer to Rod String Distance 1 (m)
 * = Not Determined



Marine Corps Museum of the Carolinas

Operator
Job Number
Water Table

Ron Stewart
22-13112
2.56 ft

Cone Number
Date and Time
GPS Location

DSA0866
9/7/2007 11:42:51 AM
3444.7295N, 07724.7203W

Location
Hole Number
County

Jacksonville, North Carolina
S-9
Onslow

CPT DATA

DEPTH (ft)

Tip Resistance
Qt TSF

Local Friction
Fs TSF

Pore Pressure
Pw PSI

SPT N*
60% Hammer

SOIL
BEHAVIOR
TYPE

REMARKS

1 - sensitive fine grained

2 - organic material

3 - clay

4 - silty clay to clay

5 - clayey silt to silty clay

6 - sandy silt to clayey silt

7 - silty sand to sandy silt

8 - sand to silty sand

9 - sand

10 - gravelly sand to sand

11 - very stiff fine grained (*)

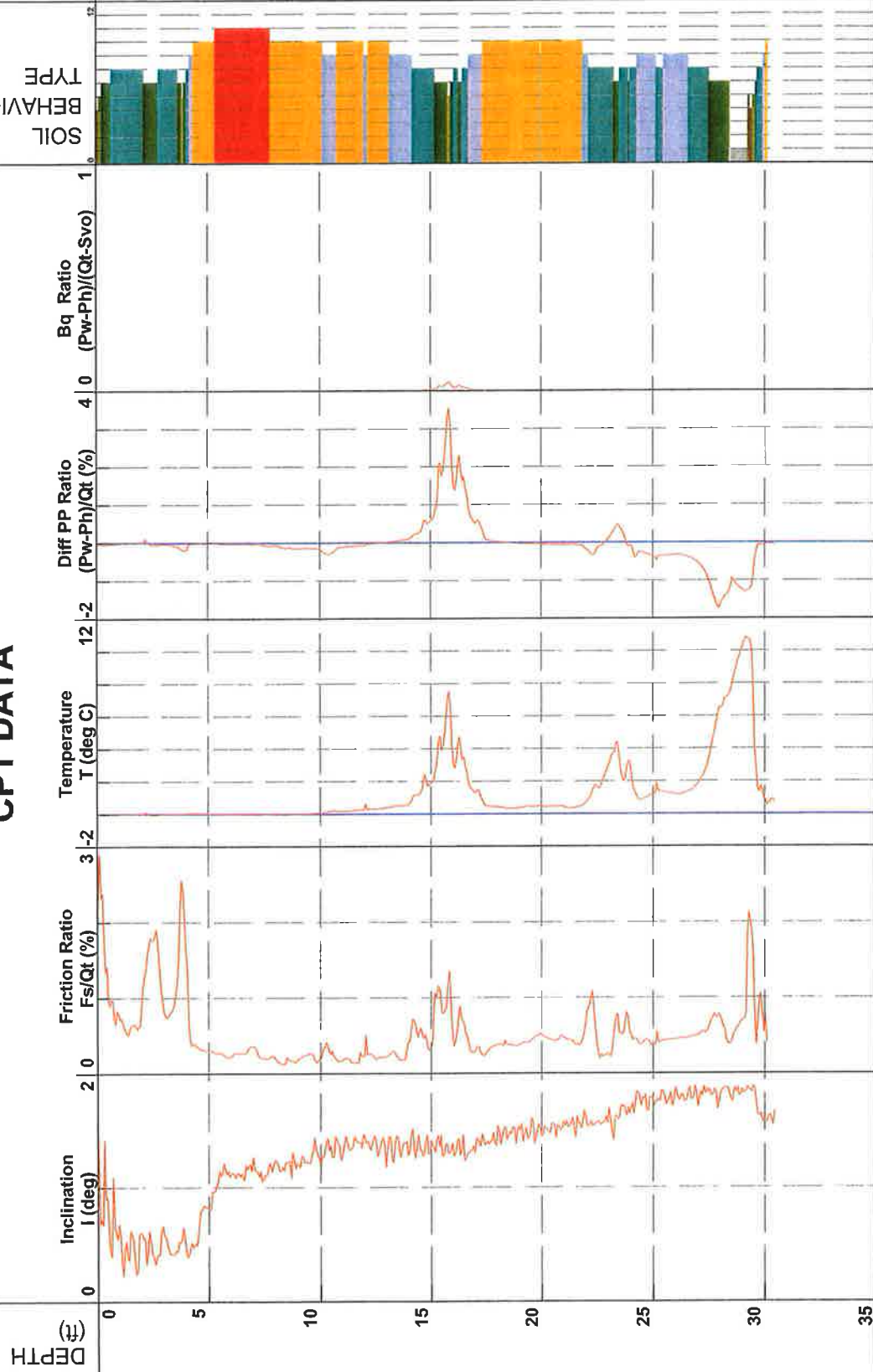
12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Ron Stewart	Cone Number	DSA0866	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/7/2007 11:42:51 AM	Hole Number	S-9
Water Table	2.56 ft	GPS Location	3444.7295N, 07724.7203W	County	Onslow

CPT DATA



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator
Job Number
Water Table

Ron Stewart
22-13112
5.71 ft

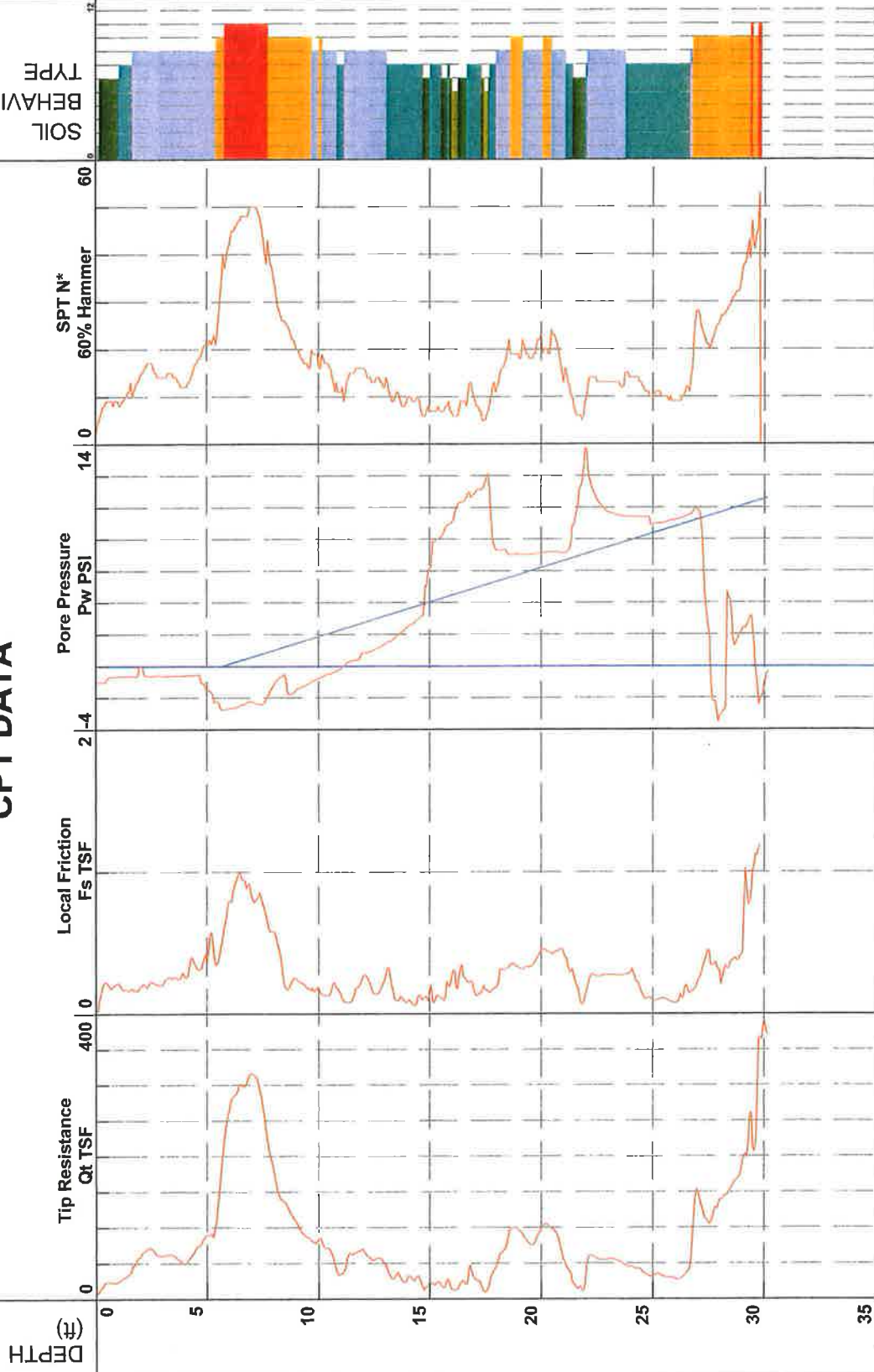
Cone Number
Date and Time
GPS Location

DSA0866
9/7/2007 12:11:24 PM
3444.7199N, 07724.7487W

Location
Hole Number
County

Jacksonville, North Carolina
S-10
Onslow

CPT DATA



REMARKS

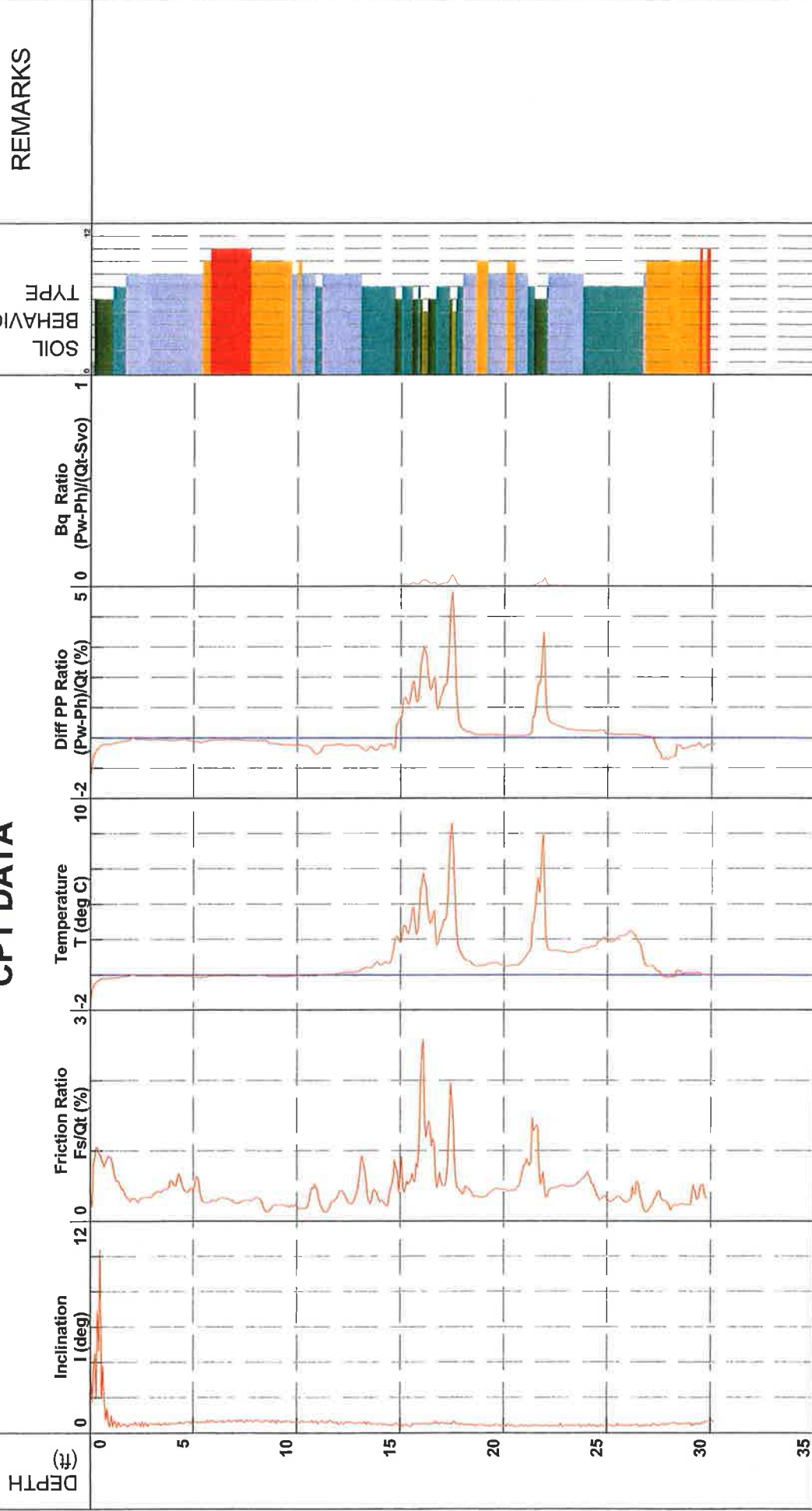
- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Ron Stewart	Cone Number	DSA0866	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/7/2007 12:11:24 PM	Hole Number	S-10
Water Table	5.71 ft	GPS Location	3444.7199N, 07724.7487W	County	Onslow

CPT DATA



1 - sensitive fine grained	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	9 - sand	12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator
Job Number
Water Table

Ron Stewart
22-13112
5.58 ft

Cone Number
Date and Time

DSG0867
9/10/2007 8:35:49 AM
3444.7199N, 07724.7487W

Location
Hole Number
County

Jacksonville, North Carolina
S-11
Onslow

CPT DATA

DEPTH (ft)

Tip Resistance
Qt TSF

350 | 0

Local Friction
Fs TSF

2 | -5

Pore Pressure
Pw PSI

50 | 0

SPT N*
60% Hammer

50 |

SOIL
BEHAVIOR
TYPE

REMARKS

1 - sensitive fine grained

2 - organic material

3 - clay

4 - silty clay to clay

5 - clayey silt to silty clay

6 - sandy silt to clayey silt

7 - silty sand to sandy silt

8 - sand to silty sand

9 - sand

10 - gravelly sand to sand

11 - very stiff fine grained (*)

12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator
Job Number
Water Table

Ron Stewart
22-13112
5.58 ft

Cone Number
Date and Time

DSG0867
9/10/2007 8:35:49 AM
3444.7199N, 07724.7487W

Location
Hole Number
County

Jacksonville, North Carolina
S-11
Onslow

CPT DATA

DEPTH (ft)

Inclination
I (deg)

6

0

Friction Ratio
Fs/Qt (%)

2

-5

Temperature
T (deg C)

30

-5

Diff PP Ratio
(Pw-Ph)/Qt (%)

25

0

Bq Ratio
(Pw-Ph)/(Qt-Svo)

1

0

SOIL
BEHAVIOR
TYPE

REMARKS

1 - sensitive fine grained

2 - organic material

3 - clay

4 - silty clay to clay

5 - clayey silt to silty clay

6 - sandy silt to clayey silt

7 - silty sand to sandy silt

8 - sand to silty sand

9 - sand

10 - gravelly sand to sand

11 - very stiff fine grained (*)

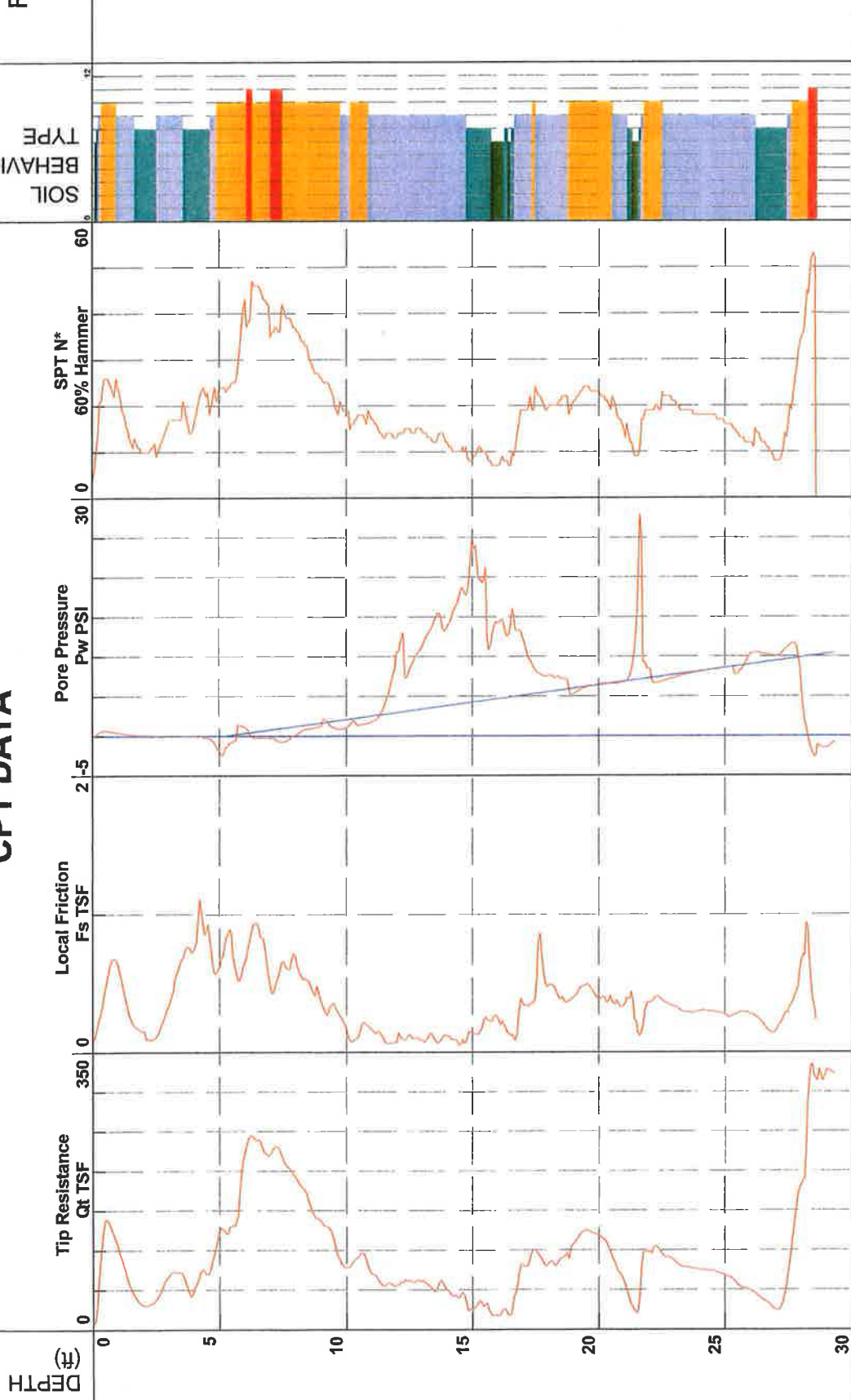
12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Ron Stewart	Cone Number	DSG0867	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/10/2007 10:03:38 AM	Hole Number	S-12
Water Table	5.18 ft		3444.7594N, 07724.7514W	County	Onslow

CPT DATA



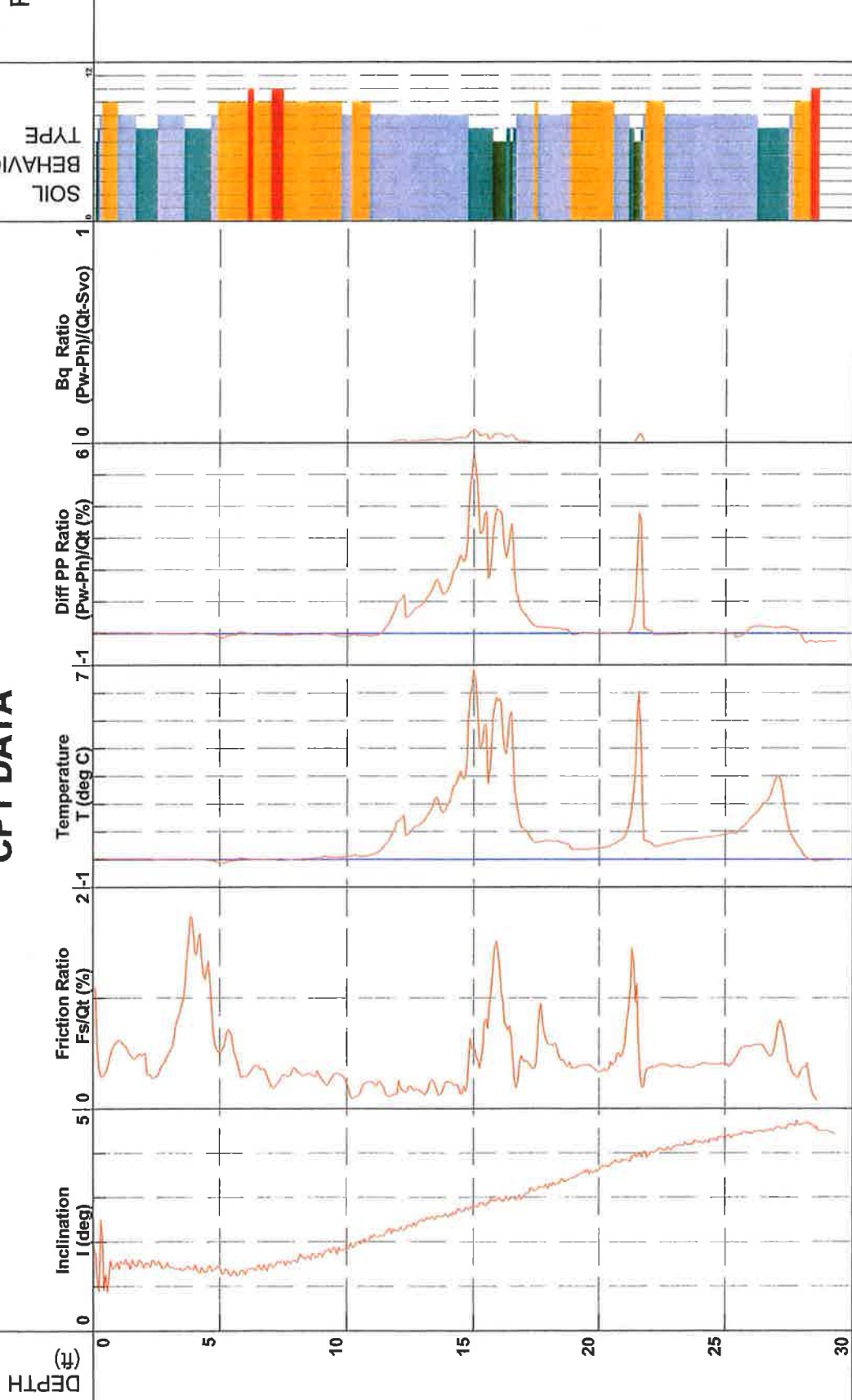
- 1 - sensitive fine grained
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- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravely sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Ron Stewart	Cone Number	DSG0867	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/10/2007 10:03:38 AM	Hole Number	S-12
Water Table	5.18 ft		3444.7594N, 07724.7514W	County	Onslow

CPT DATA



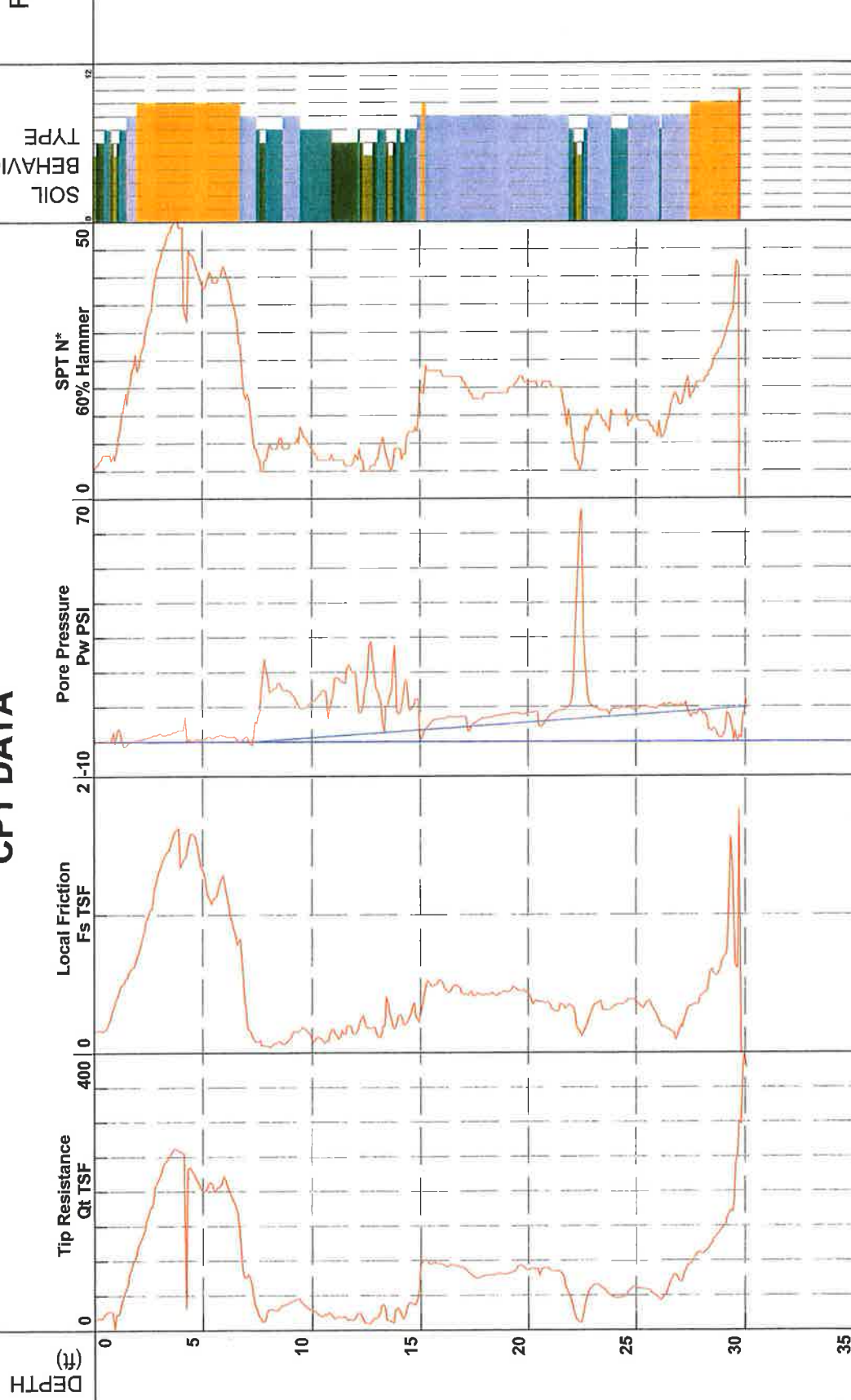
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- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Donald B. Coogan	Cone Number	DSA1030	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/6/2007 10:24:29 AM	Hole Number	S-13
Water Table	7.32 ft		3444.6947N, 07724.7685W	County	Onslow

CPT DATA

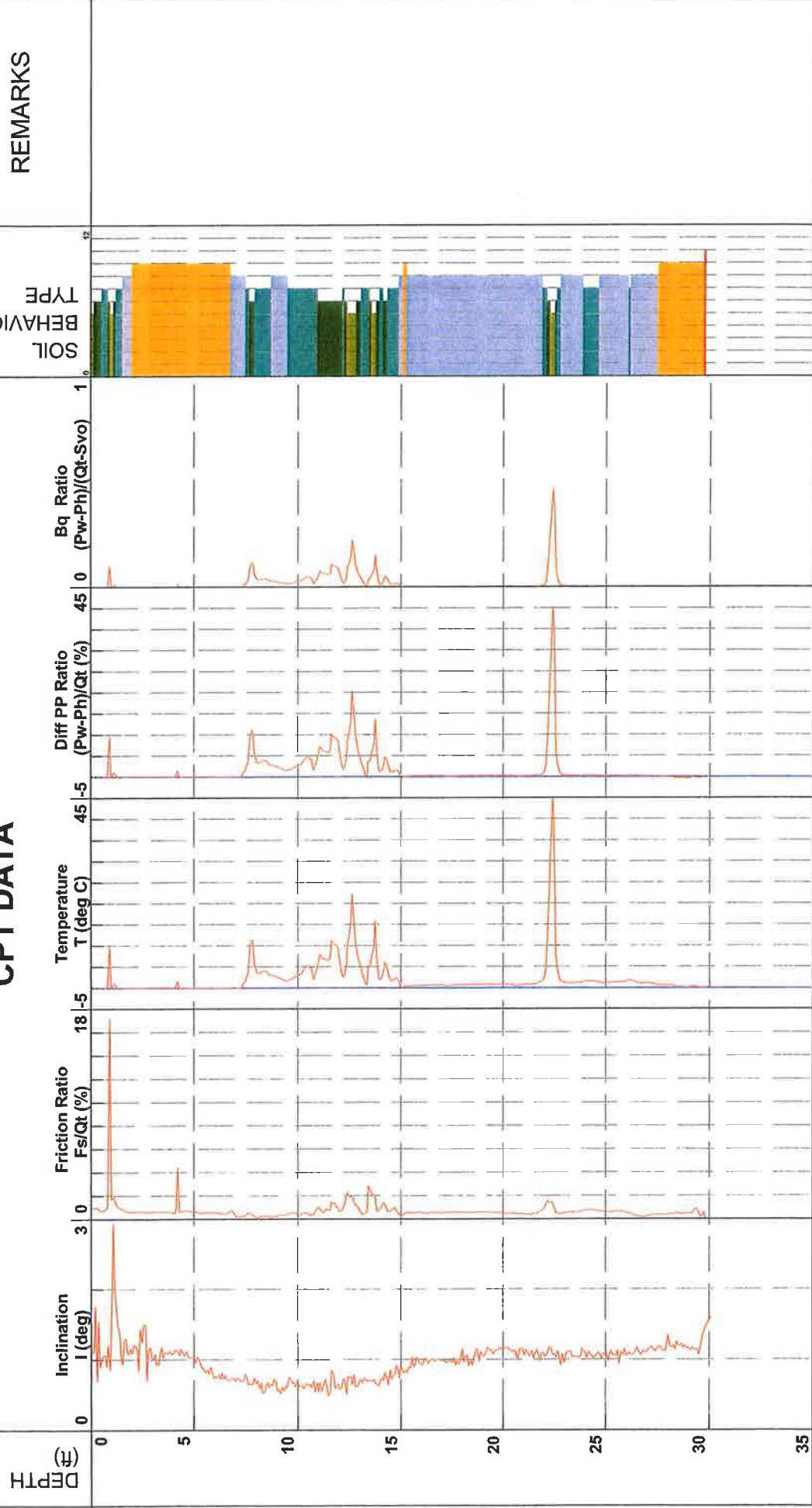




Marine Corps Museum of the Carolinas

Operator	Donald B. Coogan	Cone Number	DSA1030	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/6/2007 10:24:29 AM	Hole Number	S-13
Water Table	7.32 ft		3444.6947N, 07724.7685W	County	Onslow

CPT DATA



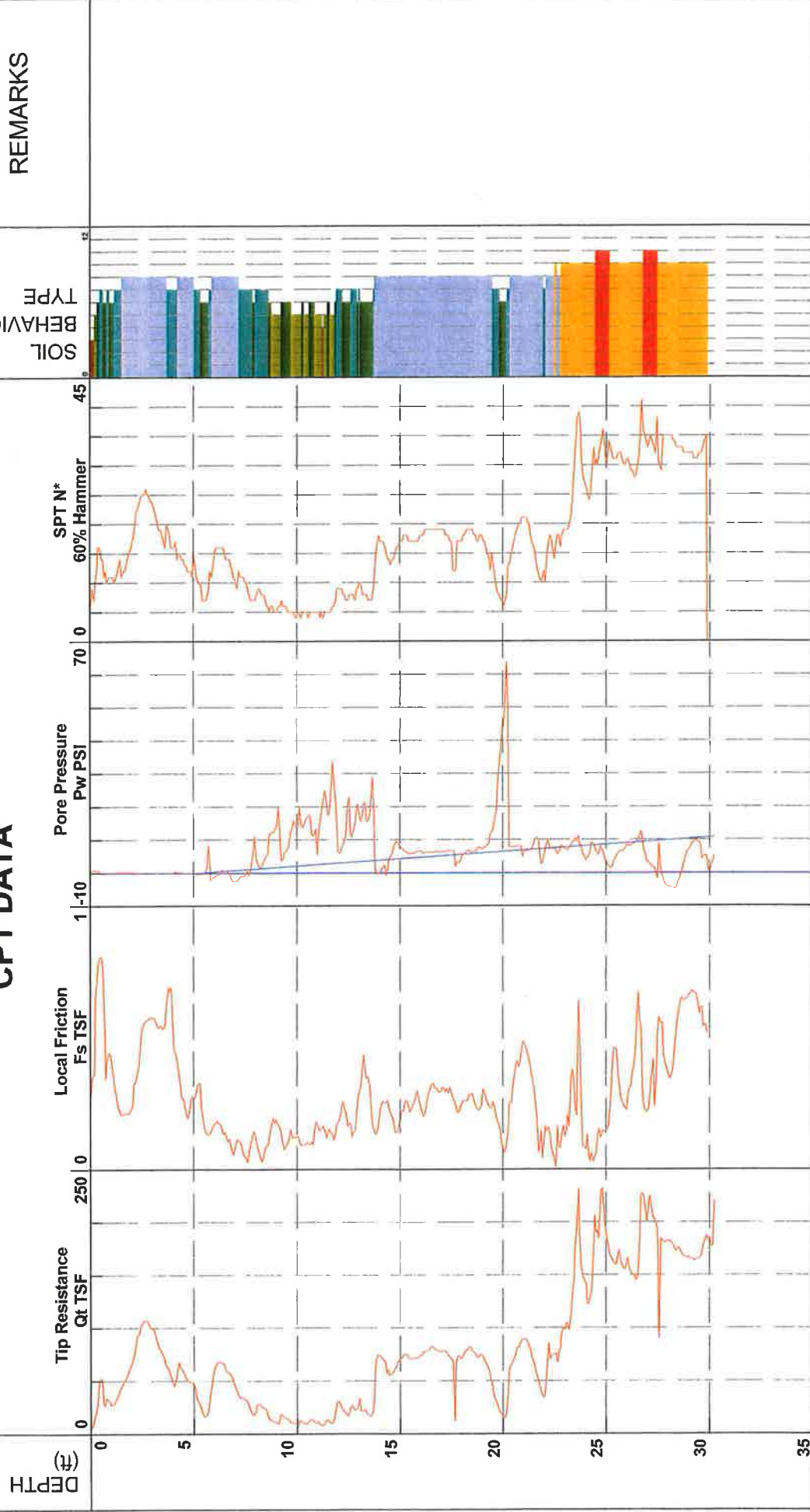
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- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Donald B. Coogan	Cone Number	DSA1030	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/6/2007 9:57:37 AM	Hole Number	S-14
Water Table	5.18 ft		3444.7125N, 07724.8083W	County	Onslow

CPT DATA



1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator
Job Number
Water Table

Donald B. Coogan
22-13112
5.18 ft

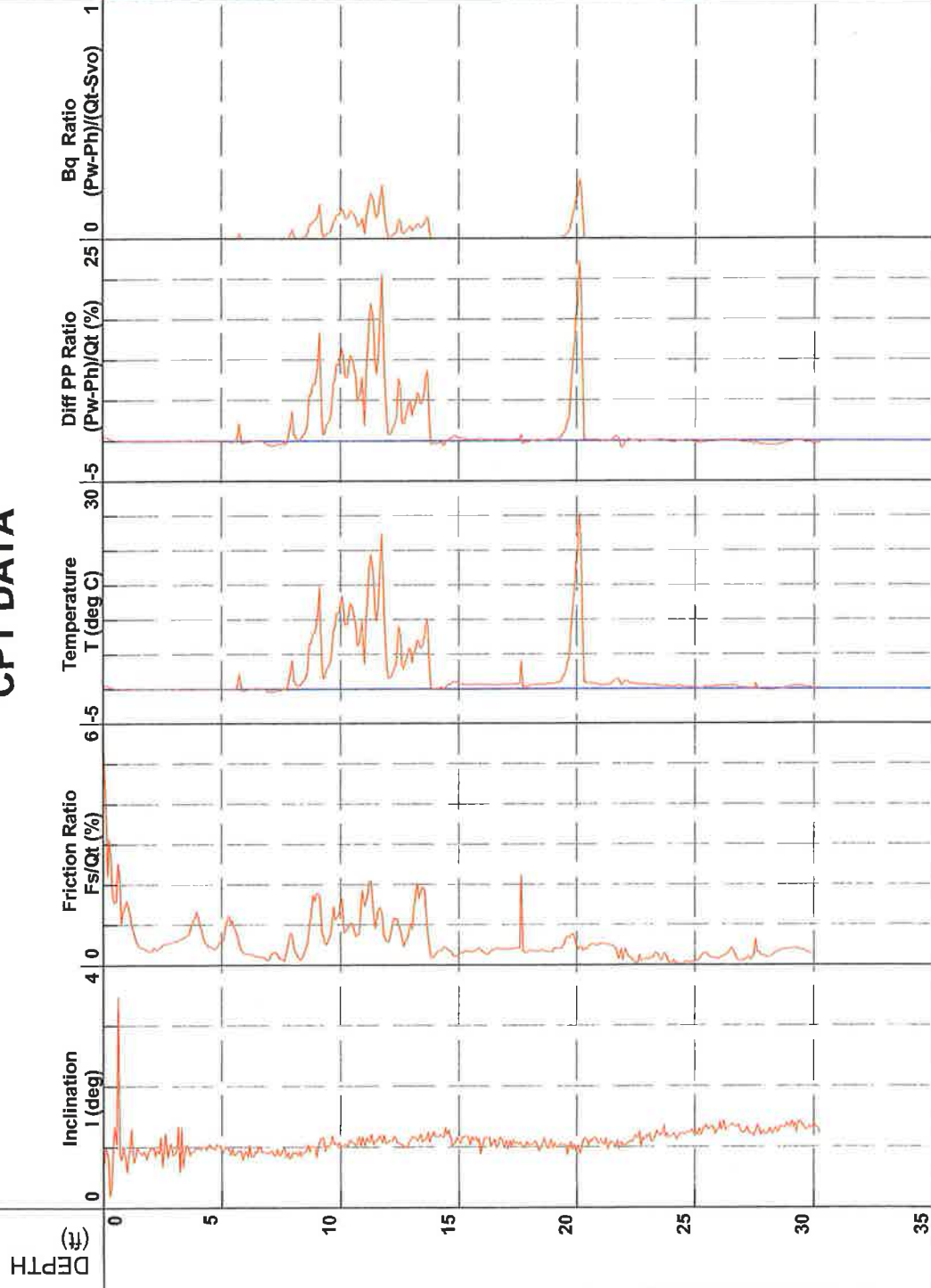
Cone Number
Date and Time

DSA1030
9/6/2007 9:57:37 AM
3444.7125N, 07724.8083W

Location
Hole Number
County

Jacksonville, North Carolina
S-14
Onslow

CPT DATA



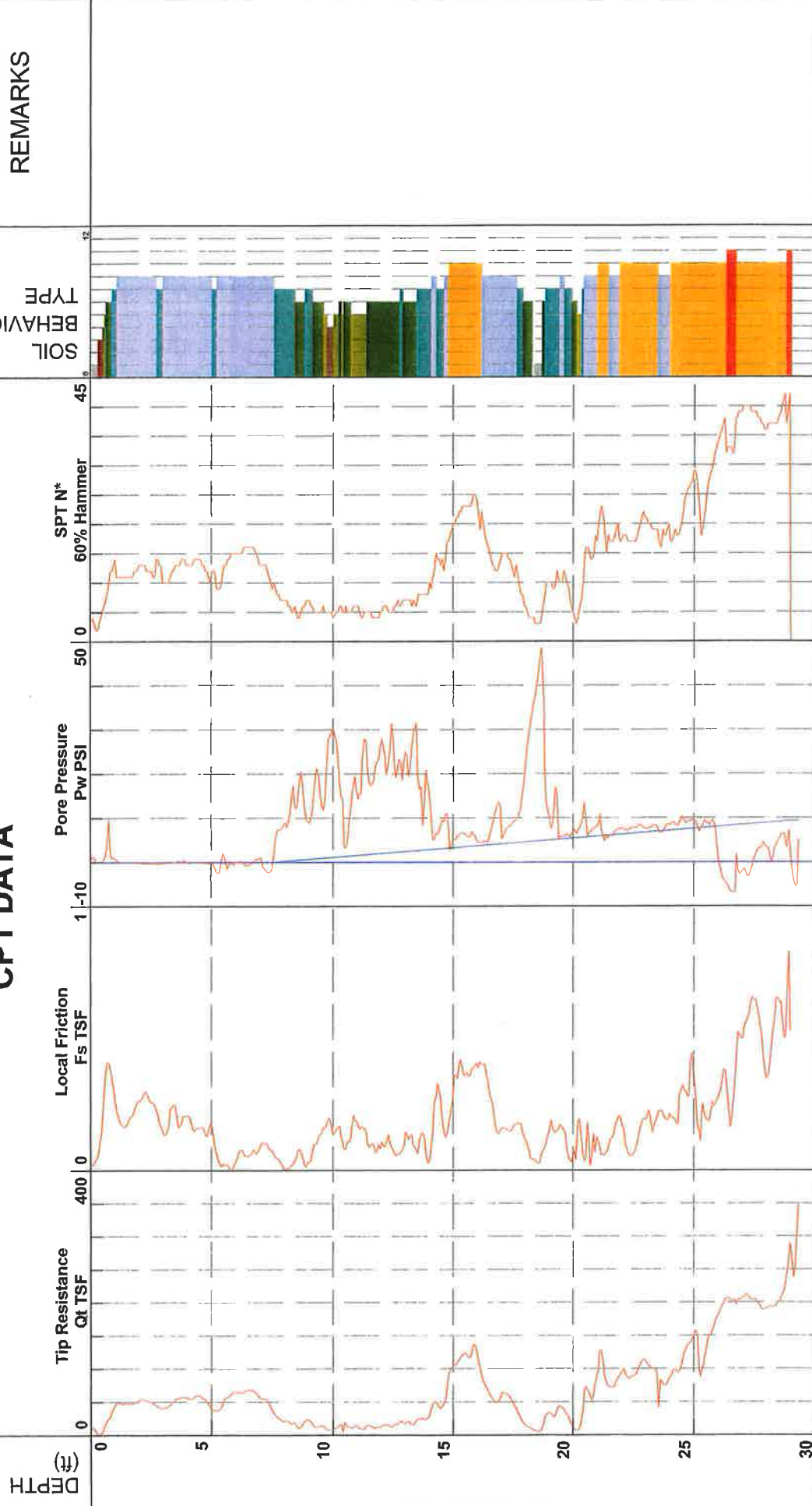
1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Donald B. Coogan	Cone Number	DSA1030	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/6/2007 9:29:10 AM	Hole Number	S-15
Water Table	7.41 ft		3444.7312N, 07724.8027W	County	Onslow

CPT DATA



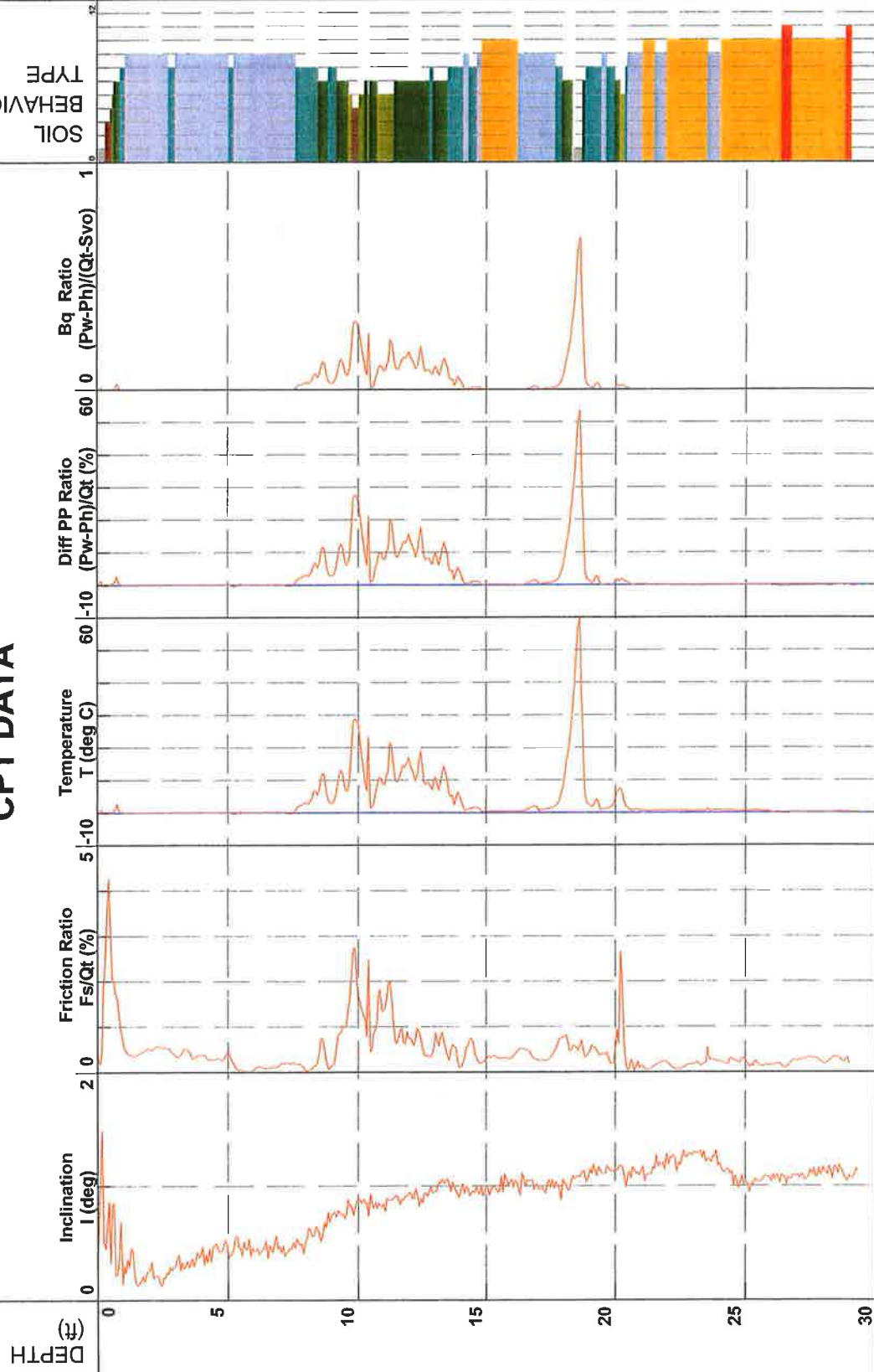
- 1 - sensitive fine grained
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Marine Corps Museum of the Carolinas

Operator	Donald B. Coogan	Cone Number	DSA1030	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/6/2007 9:29:10 AM	Hole Number	S-15
Water Table	7.41 ft		3444.7312N, 07724.8027W	County	Onslow

CPT DATA



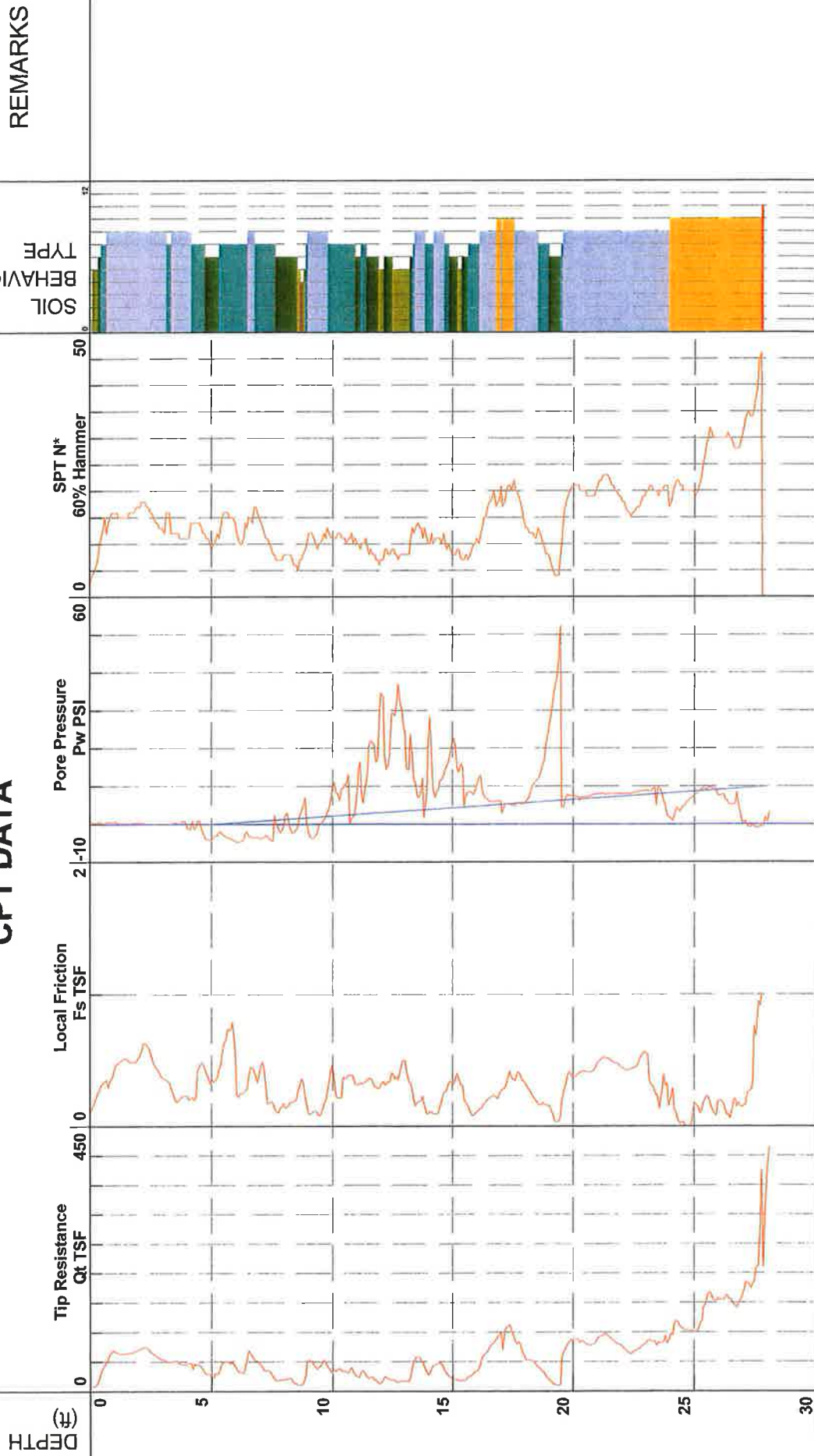
1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Donald B. Coogan	Cone Number	DSA1030	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/6/2007 11:02:45 AM	Hole Number	S-16
Water Table	4.99 ft		3444.7569N, 07724.8865W	County	Onslow

CPT DATA



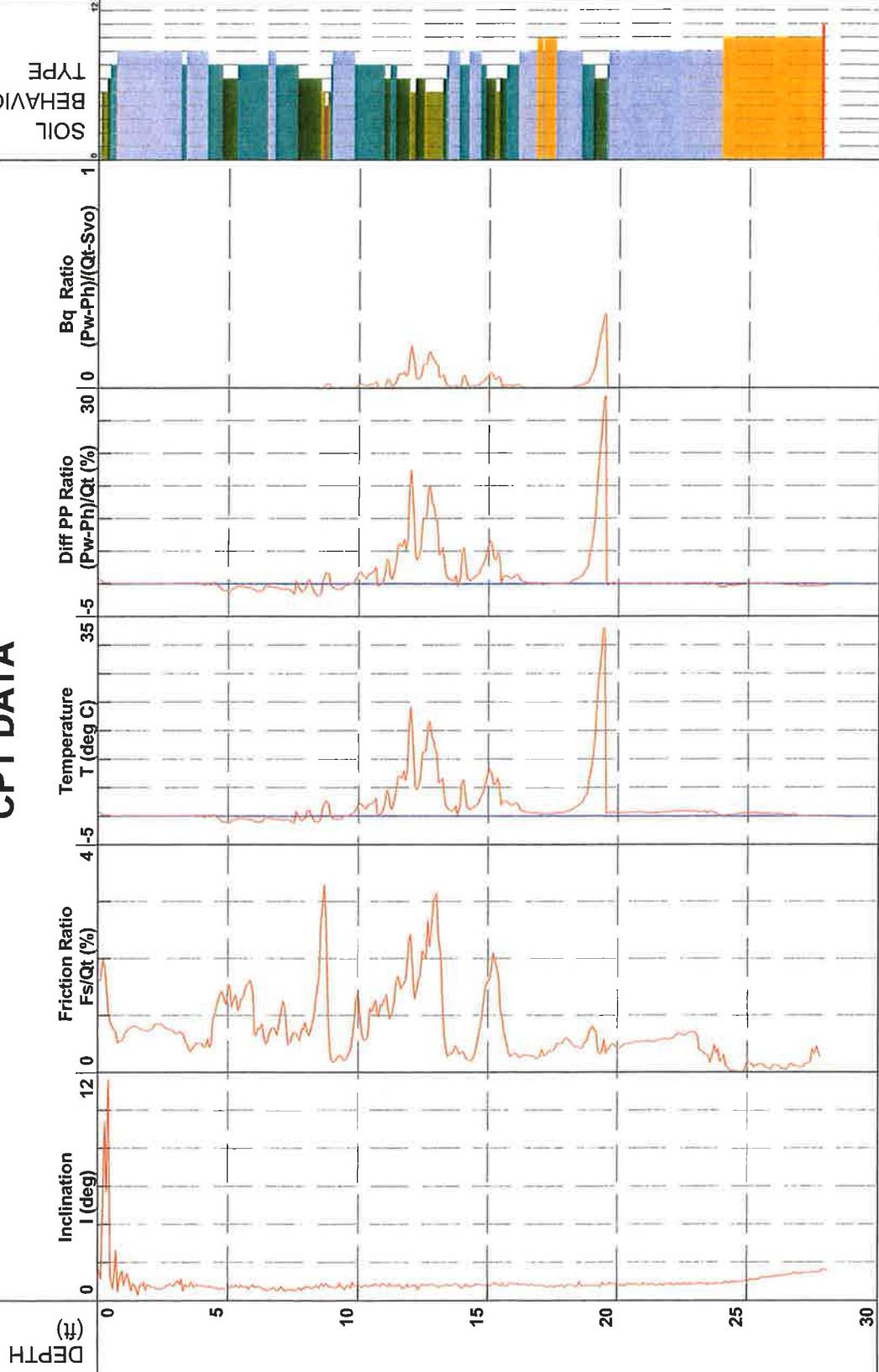
- 1 - sensitive fine grained
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- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)



Marine Corps Museum of the Carolinas

Operator	Donald B. Coogan	Cone Number	DSA1030	Location	Jacksonville, North Carolina
Job Number	22-13112	Date and Time	9/6/2007 11:02:45 AM	Hole Number	S-16
Water Table	4.99 ft		3444.7569N, 07724.8865W	County	Onslow

CPT DATA



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
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APPENDIX C
GENERAL CONDITIONS

General Conditions

The analysis, conclusions, and recommendations submitted in this report are based on the investigation previously outlined and the data collected at the points shown on the attached location plan. This report does not reflect specific variations that may occur between test locations. The borings were located where site conditions permitted and where it is believed representative conditions occur, but the full nature and extent of variations between borings and of subsurface conditions not encountered by any boring may not become evident until the course of construction. If variations become evident at any time before or during the course of construction, it will be necessary to make a re-evaluation of the conclusions and recommendations of this report and further exploration, observation, and/or testing may be required.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices and makes no other warranties, either expressed or implied, as to the professional advice under the terms of our agreement and included in this report. The recommendations contained herein are made with the understanding that the contract documents between the owner and foundation or earthwork contractor or between the owner and the general contractor and the caisson, foundation, excavating and earthwork subcontractors, if any, shall require that the contractor certify that all work in connection with foundations, piles, caissons, compacted fills and other elements of the foundation or other support components are in place at the locations, with proper dimensions and plumb, as shown on the plans and specifications for the project.

Further, it is understood the contract documents will specify that the contractor will, upon becoming aware of apparent or latent subsurface conditions differing from those disclosed by the original soil investigation work, promptly notify the owner, both verbally to permit immediate verification of the change, and in writing, as to the nature and extent of the differing conditions and that no claim by the contractor for any conditions differing from those anticipated in the plans and specifications and disclosed by the soil studies will be allowed under the contract unless the contractor has so notified the owner both verbally and in writing, as required above, of such changed conditions. The owner will, in turn, promptly notify this firm of the existence of such unanticipated conditions and will authorize such further investigation as may be required to properly evaluate these conditions.

Further, it is understood that any specific recommendations made in this report as to on-site construction review by this firm will be authorized and funds and facilities for such review will be provided at the times recommended if we are to be held responsible

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Project information.
- B. Work covered by Contract Documents.
- C. Access to site.
- D. Work restrictions.
- E. Specification and drawing conventions.

1.2 PROJECT INFORMATION

- A. Project Identification: Museum of the Marine.
 - 1. Project Location: Jacksonville, North Carolina.
- B. Owner: Museum of the Marine
- C. Architect: CJMW Architecture, 119 Brookstown Avenue: Suite 100, Winston-Salem, North Carolina 27101.
- D. Contractor: Pro Construction, Inc., 2423C N. Marine Blvd., Jacksonville, North Carolina 28546.
- E. Owner's Commissioning Agent: Commissioning WorkCx, 101 Depot Street, Jamestown, NC 27282.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. Work consists of museum exhibit space, offices and support areas as indicated in the Contract Documents
 - 2. Project is designed to comply with a Certification Level according to the U.S. Green Building Council's Leadership in Energy & Environmental Design (LEED) Rating System, as specified in Section 01 81 13 - Sustainable Design Requirements.
- B. Type of Contract.
 - 1. Project will be constructed under a single prime contract.

1.4 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Owner will award separate contracts for the following work to be performed. Some work under separate contracts will occur concurrently with construction, while other work will be subsequent to Substantial Completion. Completion of that work will depend on successful completion of preparatory work under this Contract.
 - 1. Exhibits
 - 2. Signage
 - 3. Audiovisual
 - 4. Telecommunications

1.5 ACCESS TO SITE

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

1.6 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. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

1.7 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 22 00 - UNIT PRICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements for unit prices.

1.2 DEFINITIONS

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

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

- A. Unit Price No. 1 – Unsatisfactory Soil Onsite:
 - 1. Description: Removal of soil material determined by the testing engineer to be unsatisfactory and disposed in an approved onsite location and prepared to specified standards.
 - 2. Unit of Measurement: Cubic Yard.

B. Unit Price No. 2 – Unsatisfactory Soil Offsite:

1. Description: Removal of soil material determined by the testing engineer to be unsatisfactory and disposed offsite.
2. Unit of Measurement: Cubic Yard.

C. Unit Price No. 3 – Satisfactory Soil Onsite:

1. Description: Placement of soil material determined by the testing engineer to be satisfactory which was excavated on site as part of contract work.
2. Unit of Measurement: Cubic Yard.

D. Unit Price No. 4 – Satisfactory Soil Offsite:

1. Description: Placement of soil material determined by the testing engineer to be satisfactory which is from an offsite source.
2. Unit of Measurement: Cubic Yard.

E. Unit Price No. 5 – Mass Rock:

1. Description: Removal of material determined by the testing engineer to be mass rock and disposed off site.
2. Unit of Measurement: Cubic Yard.

F. Unit Price No. 6 – Trench Rock:

1. Description: Removal of material determined by the testing engineer to be trench rock and disposed off site.
2. Unit of Measurement: Cubic Yard.

END OF SECTION

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

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

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 14 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect.
- B. Contractor-Initiated Work Change Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Work Change Proposal Request Form: Use form acceptable to Architect.

1.4 ADMINISTRATIVE CHANGE ORDERS

- A. Unit-Price Adjustment: See Section 01 22 00 - Unit Prices, for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.5 CHANGE ORDER PROCEDURES

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

1.6 CONSTRUCTION CHANGE DIRECTIVE

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Application for Payment forms with Continuation Sheets, Submittals Schedule, and Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Submit draft of AIA Document G703 Continuation Sheets.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
 - 4. Round amounts to nearest whole dollar; total shall equal 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.
 - 6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 - 7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

- a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Progress payments shall be submitted to Architect by the 25 of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
- D. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- F. Transmittal: Submit 3 signed and notarized original copies and one electronic PDF copy of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 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 final or full waivers.

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Schedule of unit prices.
 5. Submittals Schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Report of preconstruction conference.
 12. Certificates of insurance and insurance policies.
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Project meetings.
 - 3. Requests for Interpretation (RFIs).
- B. See Section 01 73 00 - Execution for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts

and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
 3. Number of Copies: Submit two copies of each submittal, one paper copy and one electronic PDF. Architect will return one copy either paper or electronic copy at their discretion.
 4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

1.5 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Critical work sequencing and long-lead items.
 - c. Designation of key personnel and their duties.
 - d. Procedures for processing field decisions and Change Orders.
 - e. Procedures for RFIs.
 - f. Procedures for testing and inspecting.
 - g. Procedures for processing Applications for Payment.
 - h. Distribution of the Contract Documents.
 - i. Submittal procedures.
 - j. Preparation of Record Documents.
 - k. Use of the premises.
 - l. Work restrictions.
 - m. Owner's occupancy requirements.
 - n. Responsibility for temporary facilities and controls.
 - o. Construction waste management and recycling.
 - p. Parking availability.
 - q. Office, work, and storage areas.
 - r. Equipment deliveries and priorities.
 - s. First aid.
 - t. Security.
 - u. Progress cleaning.
 - v. Working hours.
 3. Minutes: Contractor will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

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- a. The Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at regular intervals. Coordinate dates of meetings with preparation of payment requests.
- 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to

do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

- 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 utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) RFIs.
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
3. Reporting: Record and distribute minutes of the meeting to each party present and to interested parties.
 - 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.

1.6 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
 1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
 1. Project name.

2. Date.
 3. Name of Contractor.
 4. Name of Architect.
 5. RFI number, numbered sequentially.
 6. Specification Section number and title and related paragraphs, as appropriate.
 7. Drawing number and detail references, as appropriate.
 8. Field dimensions and conditions, as appropriate.
 9. Contractor's suggested solutions. If Contractor's solutions impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 10. Contractor's signature.
 11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
- C. Hard-Copy RFIs: CSI Form 13.2A.
1. Identify each page of attachments with the RFI number and sequential page number.
- D. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day. The maximum number of RFIs accepted from the contracting team on any one day shall be limited to five.
1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Use CSI Log Form 13.2B.
1. Project name.
 2. Name and address of Contractor.

3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: One paper copy and one PDF electronic file.
- B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.
 - 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- E. Construction Schedule Updating Reports: Submit with Applications for Payment.
- F. Daily Construction Reports: Submit at monthly intervals.
- G. Site Condition Reports: Submit at time of discovery of differing conditions.

1.4 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.

PART 2 - PRODUCTS

2.1 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 story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 - Submittal Procedures, in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. 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.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.

- 5. Pending modifications affecting the Work and Contract Time.
- F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.
- G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
 - 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 - 2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 3. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.

- h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and commissioning.
 - j. Punch list and final completion.
 - k. Activities occurring following final completion.
- 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
- 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
- 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
 - 1. Contractor or subcontractor and the Work or activity.
 - 2. Description of activity.
 - 3. Main events of activity.
 - 4. Immediate preceding and succeeding activities.
 - 5. Early and late start dates.
 - 6. Early and late finish dates.
 - 7. Activity duration in workdays.
 - 8. Total float or slack time.
 - 9. Average size of workforce.
 - 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 - 1. Identification of activities that have changed.
 - 2. Changes in early and late start dates.
 - 3. Changes in early and late finish dates.
 - 4. Changes in activity durations in workdays.
 - 5. Changes in the critical path.
 - 6. Changes in total float or slack time.
 - 7. Changes in the Contract Time.

2.3 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events.
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.
 15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial completions and occupancies.
 19. Substantial Completions authorized.
- B. 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 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.

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

END OF SECTION

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. See Section 01 77 00 - Closeout Procedures for submitting warranties.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Submittals Schedule: Submit list of submittals and time requirements for scheduled performance of related construction activities.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 15 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Resubmittal Review: Allow 15 working days for review of each resubmittal.
 - 3. Concurrent Consultant Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 21 working days for initial and

resubmittal reviews of each submittal. Submittal will be returned to Architect before being returned to Contractor.

- a. Transmit directly to Architect's consultant, Owner, Construction Manager, or other parties required.
- b. Provide duplicate copy of transmittal to Architect.
- c. Consultant-reviewed submittals will be returned to Architect to be then returned to Contractor.

D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date of submittal to Architect.
 - c. Name, address, phone, and fax number of Architect.
 - d. Name, address, phone, and fax number of Contractor.
 - e. Name, address, phone, and fax number of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
 - m. Identify all choices and selections which need to be made by the Architect.
 - n. Identify required performance criteria and product performance criteria.

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

F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
2. Contractor to maintain copies for inclusion in maintenance manuals. Include with final closeout documents

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- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will not accept or return received from sources other than Contractor.
1. Transmittal Form: On the transmittal, record relevant information and requests for data. On a separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements. Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Drawing number and detail references, as appropriate.
 - j. Transmittal number.
 - k. Submittal and transmittal distribution record.
 - l. Remarks.
 - m. Signature of transmitter.
 2. On an attached separate second sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal at top of second sheet.
 3. Include on second sheet Contractor's certification, signed and dated, stating that information submitted complies with Contract Documents.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked "Reviewed" or "Reviewed as Noted."
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating "Reviewed" or "Reviewed as Noted" taken by Architect.

1.4 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
1. The Architect will require payment of a fee per sheet, indicted in the Sample Waiver following this Section, for preparation of designer CAD files prior to sending information.
 2. Contractor must obtain an "Electronic Media (CADD) Release Waiver" from the Architect. Refer to sample Waiver following this Section.
 3. Payment and executed Waiver must be returned to Architect before documents will be transmitted.
 4. Contractor must modify documents to represent any post-bid changes in the plans.

PART 2 - PRODUCTS**2.1 SUBMITTALS**

- A. General: Prepare and submit Submittals required by individual Specification Sections.
1. Procedure: Submit one paper copy and one electronic PDF of each Product Data and Shop Drawing submittal unless otherwise indicated herein or by Architect. Architect will return one paper or one PDF copy at their discretion; Contractor shall maintain one set of marked submittals for closeout turn over to Owner at project completion.
- B. Collect information for each element of construction and type of product or equipment or work result and submit at one time.
- C. Product Data: Do not submit partial product submittals.
1. Mark each copy of each submittal to show which products and options are applicable.
 2. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts (3 copies in color).
 - e. Manufacturer's catalog cuts (original cut sheets in color).
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - l. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.

-
- D. 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 Contractor submits executed Waiver and required fees as described above for use of Architect's CAD Drawings as basis for Shop Drawings. Unaltered Contract Documents and manufacturer's standard published details are not acceptable and will be returned without comment.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Show compliance with specified standards on second transmittal sheet by listing design requirements and criteria of products as adjacent columns.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
- E. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label and 8-1/2 by 11 inch sheet on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.
 - e. Label interior finish samples with code indicate in Finish Legend
 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit three full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit four sets of Samples. Architect will retain one Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample at job site office.
 - 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.
6. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label and 8-1/2 x 11 inch sheet that includes the following:
 - a. Project name.
 - b. Date of submittal to Architect.
 - c. Unique identifier, including original date of submittal, and revision date and revision number. Use CSI format for identifying submittal.
 - d. Number and title of appropriate Specification Section.
 - e. Name and address of Architect.
 - f. Name, address, phone number and fax number of Contractor.
 - g. Name, address, phone number and fax number of subcontractor.
 - h. Name, address, phone number and fax number of supplier.
 - i. Name of manufacturer.
 - j. Drawing number and detail references, related to submittal.
 - k. Other necessary identification.
 - l. Identify all choices and selections which need to be made by the Architect.
 - m. Identify required performance criteria and product performance criteria.
 - n. Size limitations.
 - o. Compliance with recognized standards.
 - p. Availability.
 - q. Delivery fabrication schedule.

-
- F. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location.
1. Include the following information in tabular form:
 - a. Type of product. Include unique identifier for each product.
 - b. Number and name of room or space.
 - c. Location within room or space.
 2. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Architect will return one copy.
 - a. Mark up and retain one returned copy as a Project Record Document.
- G. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.
1. Include the following information in tabular form in a Microsoft Excel document.
 - a. Name, address, and telephone number of entity performing subcontract or supplying products.
 - b. Number and title of related Specification Section(s) covered by subcontract.
 - c. Drawing number and detail references, as appropriate, covered by subcontract.
 2. Number of Copies: Submit two copies of subcontractor list, unless otherwise indicated. Architect will return one copy.
- H. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- I. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- J. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- K. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- L. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- M. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

- N. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- O. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- P. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- Q. Schedule of Tests and Inspections: Comply with requirements specified in Section 01 40 00 - Quality Requirements.
- R. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- S. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- T. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- U. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment.
- V. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- W. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of

manufacturer. Copies of this information shall be located in the jobsite offices attached to Shop Drawings. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

X. **Manufacturer's Field Reports:** Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

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

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

2.2 **DELEGATED DESIGN**

A. **Performance and Design Criteria:** Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. **Delegated-Design Submittal:** In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

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

PART 3 - EXECUTION**3.1 CONTRACTOR'S REVIEW**

- A. 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. If after Contractor review drawings contain a significant number of markings for corrections, Contractor shall have Shop Drawings revised before sending to Architect. Do not submit heavily marked Shop Drawings. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp. Submittals that have clearly not been reviewed by the Contractor prior to being submitted will be returned without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 - 1. Final Unrestricted Release: When the Architect marks a submittal "Reviewed," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
 - 2. Final-But-Restricted Release: When the Architect marks a submittal "Reviewed as Noted," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
 - 3. Returned for Resubmittal: When the Architect marks a submittal "Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.
 - a. Do not use or allow others to use, submittals marked "Revise and Resubmit" at the Project site or elsewhere where Work is in progress.
 - 4. Other Action: Where a submittal is for information or record purposes or special processing or other activity, the Architect will return the submittal marked "Action Not Required."
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review or held until all required information is sent. Architect will notify Contractor if submittal is incomplete, and will direct Contractor to indicate on Submittal Schedule that submittal is incomplete until all information is provided.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION



Planning • Engineering • Interior Design

Date

Name

Company Name

Address

City/State/Zip

RE: **Project Name**
 Electronic File Release

Dear Name:

In accordance with your request, CJMW Architecture will provide to **Company Name** an original copy of our copyrighted database for the above-referenced project. CJMW Architecture retains all ownership in the database and copyright therein and we grant to you a limited license to make a derivative work of the database for the purpose of preparation and submission of drawings for the above-mentioned project.

You assume all risk, responsibility and liability for all claims, loss liability, damages or awards arising from your use of the database, or from amendments or revisions to the database made by you or your employees, and use of the database with such amendments or revisions.

You shall indemnify, hold harmless and defend CJMW Architecture, its employees and consultants, as a result of all such claims, loss liability, damages or awards. You may not distribute such documents to others except by agreement in writing from CJMW Architecture. *Reference is made to [Article 1.3.1] [Article 7] of the General Conditions of the Contract in regard to ownership and copyright of the drawings.*

The delivery of these files should not be construed to provide an express warranty or a guarantee to anyone that all dimensions, detail and graphic representations are exact or to indicate that the use of this drawing implies the review and approval by the design professional of any future use.

To confirm your approval of these provisions, please execute in the space provided and return a copy of this letter by facsimile or in person to our office (Fax No. 336.724.2407).

Client Name
Subject/RE line
Date
Page 2 of 2

Upon receipt of the executed letter and requested administrative fee of \$100.00 per drawing sheet, the database will be furnished to you. Use of these files in any way constitutes approval of the provisions contained herein.

Sincerely,

Your Name
CJMW Architecture

CAD Release

ATTACHMENT A

December 29, 2011

The following sheets / files will be furnished to **Company Name**

1)

Terms and Conditions Hereby Agreed to:

Company Name

By: _____

Date: _____

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 2. 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.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- D. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- J. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

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. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.

8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 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. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.6 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 - Submittal Procedures.
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. 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.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -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.

1.7 SPECIAL TESTS AND INSPECTIONS

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

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION****3.1 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 Section 01 73 29 - Cutting and Patching.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 41 00 - SPECIAL INSPECTIONS AND STRUCTURAL TESTING

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 GENERAL REQUIREMENTS

- A. Special Inspections and Structural Testing shall be in accordance with Chapter 17 of the International Building Code, 2009 Edition.
- B. The program of Special Inspections and Structural Testing is a Quality Assurance Program intended to ensure that the work is performed in accordance with the Contract Documents.
- C. This specification section is intended to inform the Contractor of the Owner's quality assurance program and the extent of the Contractor's responsibilities. This specification section is also intended to notify the Special Inspector (SI), Independent Testing Laboratory (ITL), and other Agents of the Special Inspector of their requirements and responsibilities.

1.3 SCHEDULE OF INSPECTIONS AND TESTS

- A. Required inspections and tests are described in the "Statement of Special Inspections" attached at the end of this section, and in the individual specification Sections for the items to be inspected or tested.

1.4 QUALIFICATIONS

- A. The Special Inspector shall be a licensed Professional Engineer who is approved by the Structural Engineer of Record (SER) and the Building Official.
- B. The Testing Laboratory and individual technicians shall be approved by the SER and the Building Official.
- C. The Testing Laboratory shall maintain a full time licensed Professional Engineer on staff who shall certify the test reports. The Engineer shall be responsible for the training of the testing technicians and shall be in responsible charge of the field and laboratory testing operations.
- D. Special Inspections shall be performed by inspectors who are licensed Professional Engineers, Engineers-In-Training, or Engineering Interns with an education and background in structural engineering except as indicated below.

1.5 SUBMITTALS

- A. The Special Inspector and Testing Laboratory shall submit to the SER and Building Official for review a copy of their qualifications which shall include the names and qualifications of each of the individual inspectors and technicians who will be performing inspections or tests.
- B. The Special Inspector and Testing Laboratory shall disclose any past or present business relationship or potential conflict of interest with the Contractor or any of the Subcontractors whose work will be inspected or tested.

1.6 PAYMENT

- A. The Owner shall engage and pay for the services of the Special Inspector, Agents of the Special Inspector, and the Independent Testing Laboratory.
- B. If any materials which require Special Inspections are fabricated in a plant which is not located within 100 miles of the project, the Contractor shall be responsible for the travel expenses of the Special Inspector or Testing Laboratory.
 - 1. Expenses shall be adequate to provide same-day round-trip transportation to remote plant.
 - 2. Expenses shall include travel, lodging and meals.
- C. The Contractor shall be responsible for the cost of any retesting or re-inspection of work which fails to comply with the requirements of the Contract Documents.

1.7 CONTRACTOR RESPONSIBILITIES

- A. The Contractor shall cooperate with the Special Inspector and his agents so that the Special Inspections and testing may be performed without hindrance.
- B. The Contractor shall review the "Statement of Special Inspections" and shall be responsible for coordinating and scheduling inspections and tests. The Contractor shall notify the Special Inspector or Testing Laboratory at least 24 hours in advance of a required inspection or test. Un-inspected work that required inspection may be rejected solely on that basis.
- C. The Contractor shall provide incidental labor and facilities to provide access to the work to be inspected or tested, to obtain and handle samples at the site or at the source of products to be tested, and to facilitate tests and inspection, storage and curing of test samples.
- D. The Contractor shall keep at the project site the latest set of construction drawings, field sketches, approved and field use shop and erection drawings, and specifications for use by the inspectors and testing technicians.
- E. The Special Inspection program shall in no way relieve the Contractor of his obligation to perform work in accordance with the requirements of the Contract Documents or from implementing an effective Quality Control program. All work that is to be subjected to Special Inspections shall first be reviewed by the Contractor's quality control personnel.
- F. The Contractor shall be solely responsible for construction site safety.

1.8 LIMITS ON AUTHORITY

- A. The Special Inspector or Testing Laboratory may not release, revoke, alter, or enlarge on the requirements of the Contract Documents.
- B. The Special Inspector or Testing Laboratory will not have control over the Contractor's means and methods of construction.
- C. The Special Inspector or Testing Laboratory shall not be responsible for construction site safety.
- D. The Special Inspector or Testing Laboratory has no authority to stop the work.

1.9 STATEMENT OF SPECIAL INSPECTIONS

- A. The "Statement of Special Inspections" prepared by the SER shall be submitted by the Contractor with the application for Building Permit.

1.10 RECORDS AND REPORTS

- A. Detailed daily reports shall be prepared of each inspection and test and submitted to the Special Inspector. Reports shall include:
 - 1. date of test or inspection
 - 2. name of inspector or technician
 - 3. location of specific areas tested or inspected
 - 4. description of test or inspection and results
 - 5. applicable ASTM standard
 - 6. weather conditions
 - 7. Engineer's seal and signature
- B. The Special Inspector shall submit interim reports to the Building Official at the end of each week which includes all inspections and test reports received that week. Copies shall be sent to the SER, Architect, and Contractor.
- C. Any discrepancies from the Contract Documents found during a Special Inspection shall be immediately reported to the Contractor. If the discrepancies are not corrected, the Special Inspector shall notify the SER and Building Official. Reports shall document all discrepancies identified and the corrective action taken.
- D. The Testing Laboratory shall immediately notify the Special Inspector and the SER by telephone, fax or email of any test results which fail to comply with the requirements of the Contract Documents.
- E. Reports shall be submitted to the Special Inspector within 7 days of the inspection or test. Hand written reports may be submitted if final typed copies are not available.
- F. At the completion of the work requiring Special Inspections, each inspection agency and testing laboratory shall provide a statement to the Special Inspector that all work was

completed in substantial conformance with the Contract Documents and that all appropriate inspections and tests were performed.

1.11 FINAL REPORT OF SPECIAL INSPECTIONS

- A. The "Final Report of Special Inspections" shall be completed by the Special Inspector and submitted to the SER and Building Official prior to the issuance of a Certificate of Use and Occupancy.
- B. The "Final Report of Special Inspections" will certify that all required inspections have been performed and will itemize any discrepancies that were not corrected or resolved.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

STATEMENT OF SPECIAL INSPECTIONS

PROJECT: Museum of the Marine

LOCATION: Jacksonville, NC

PERMIT APPLICANT: Museum of the Marine

APPLICANT'S ADDRESS: 200 Valencia Drive, Suite 113
Jacksonville, NC 28546

ARCHITECT OF RECORD: Scott Lahr, AIA

STRUCTURAL ENGINEER OF RECORD: Stephen E. Adams, P.E.

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: Stephen E. Adams, P.E.

This Statement of Special Inspections is submitted in accordance with Section 1704 of the 2009 International Building Code. It includes a *Schedule of Special Inspection Services* applicable to the above-referenced Project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections. If applicable, it includes *Requirements for Seismic Resistance* and/or *Requirements for Wind Resistance*.

Are Requirements for Seismic Resistance included in the Statement of Special Inspections?

☐ Yes

☒ No

Are Requirements for Wind Resistance included in the Statement of Special Inspections?

☒ Yes

☐ No

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the Building Official and to the Registered Design Professional in Responsible Charge at a frequency agreed upon by the Design Professional and the Building Official prior to the start of work. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge prior to competition of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and corrections of any discrepancies noted in the inspections shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge at the conclusion of the project.

Frequency of interim report submittals to the Registered Design Professional in Responsible Charge:

☐ Weekly

☐ Bi-Weekly

☒ Monthly

Other; specify: _____

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by:

Stephen E. Adams, P.E.

Type or print name



Signature

12/30/2011

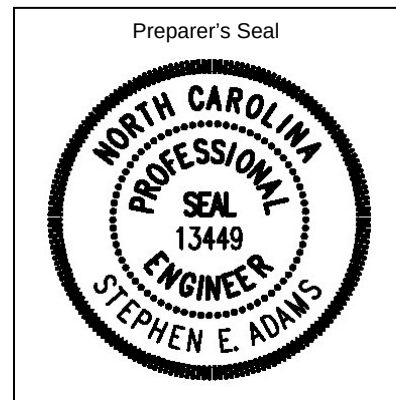
Date

Building Official's Acceptance:

Signature

Date

Permit Number:



Frequency of interim report submittals to the Building Official:

☒ Monthly

☐ Bi- Monthly

☐ Upon Completion

Other; specify: _____

Statement of Special Inspections Requirements for Seismic Resistance

See the Schedule of Special Inspections for inspection and testing requirements

Seismic Design Category: B

Statement of Special Inspection for Seismic Resistance Required (Yes/No): No

Description of seismic force-resisting system subject to special inspection and testing for seismic resistance:

(Required for Seismic Design Categories C, D, E or F)

Not Applicable

Description of designated seismic systems subject to special inspection and testing for seismic resistance:

(Required for architectural, electrical and mechanical systems and their components that require design in accordance with ASCE 7-05 Chapter 13, have a component importance factor, I_p , greater than one and are in Seismic Design Categories D, E or F.)

Not Applicable

Description of additional seismic systems and components requiring special inspections and testing:

(Required for systems noted in IBC Section 1705.3, cases 3, 4 & 5 in Seismic Design Categories C, D, E or F.)

Not Applicable

Statement of Responsibility:

Each contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.

Not Applicable

Statement of Special Inspections Requirements for Wind Resistance

See the Schedule of Special Inspections for inspection and testing requirements

Basic Wind Speed (3 second gust): 130 m.p.h.

Wind Exposure Category: C

Statement of Special Inspection for Wind Resistance Required (Yes/No): Yes

(Required in wind exposure Category B, where the basic wind speed is 120 miles per hour or greater.

Required in wind exposure Category C or D, where the basic wind speed is 110 miles per hour or greater)

Description of main wind force-resisting system subject to special inspection for wind resistance:

Precast Concrete Shear Walls

Masonry Shear Walls

Description of wind force-resisting components subject to special inspection for wind resistance:

Precast Concrete Shear Walls and associated connections, including anchorage to foundations

Steel Roof Deck and associated connections

Wall framing connections to roofs, floors and steel framing

Fabrication and installation of systems or components required to meet requirements for impact-resistance, except for manufactured systems or components that have a label indicating compliance.

Statement of Responsibility:

Each contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	Museum of the Marine, Jacksonville, NC				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
1704.2 Inspection of Fabricators					
Verify fabrication/quality control procedures.	In-plant review	Y	Periodic	1	
1704.3 Steel Construction					
Material verification of high-strength bolts, nuts, and washers.	Review material markings and certificates of compliance	Y	Periodic	1	
Inspection of high-strength bolting:	Field inspection				
a. Snug-tight joints		Y	Periodic	1	
b. Pre-tensioned and slip-critical joints					
1) Turn-of-nut with matching markings		Y	Periodic	1	
2) Direct tension indicator		Y	Periodic	1	
3) Twist-off bolt		Y	Periodic	1	
4) Turn-of-nut without matching markings		Y	Continuous	1	
5) Calibrated wrench		Y	Continuous	1	
Material verification of structural steel:					
a. Identification markings	Field inspection	Y	Periodic	1	
b. Certified mill tests	Review submittals	Y	Periodic	1	
Weld filler materials.	Review certificate of compliance and field verification	Y	Periodic	1	
Structural steel welding:	Shop and field inspection				
a. Complete and partial penetration groove welds		Y	Continuous	1	
b. Multi-pass fillet welds		Y	Continuous	1	
c. Single-pass fillet welds > 5/16"		Y	Continuous	1	
d. Single-pass fillet welds ≤ 5/16"		Y	Periodic	1	
e. Floor and deck welds		Y	Periodic	1	

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	Museum of the Marine, Jacksonville, NC				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
Reinforcing steel welding:	Shop and field inspection				
a. Verification of weldability of steel other than ASTM A 706		N	Periodic		
b. Reinforcing steel-resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special concrete shear walls, and shear reinforcement		N	Continuous		
c. Shear reinforcement		N	Continuous		
d. Other reinforcing steel		N	Periodic		
Inspection of steel frame joint details for compliance with approved construction documents.	Field inspection				
a. Details such as bracing & stiffening		Y	Periodic	1	
b. Member locations		Y	Periodic	1	
c. Application of joint details at each connection		Y	Periodic	1	
1704.4 Concrete Construction					
Inspection of reinforcing steel installation.	Field inspection	Y	Periodic	1	
Inspection of prestressing steel installation.	In-plant or field review	Y	Periodic	1	
Inspection of prestressed concrete:	In-plant or field review				
a. Application of prestressing force		Y	Continuous	1	
b. Grouting of bonded prestressing tendons in the seismic-force-resisting system		Y	Continuous	1	

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	Museum of the Marine, Jacksonville, NC				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
Inspection of anchor bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased per IBC section 1911.5 or where strength design is used	Field inspection	Y	Continuous	1	
Inspection of anchors and reinforcing steel installed in hardened concrete: verify anchor type, anchor dimensions, hole dimensions, hole cleaning procedures, anchor spacing, edge distances, concrete minimum thickness, anchor embedment and tightening torque	Field inspection	Y	Periodic	1	
Verify use of approved design mix	Field review	Y	Periodic	1	
Fresh concrete sampling	Field testing	Y	Continuous	1	
Inspection of concrete and shotcrete placement for proper application techniques	Field inspection	Y	Continuous	1	
Concrete and shotcrete curing operations.	Field inspection	Y	Periodic	1	
Erection of precast concrete members.	Field inspection	Y	Periodic	1	
Concrete strength testing and verification of compliance with construction documents	Field testing and review of laboratory reports	Y	Periodic	1	
Verification of in-situ concrete strength, prior to stressing of tendons in post tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	Review field testing and laboratory reports	N	Periodic		
Inspection of formwork for shape, lines, location and dimensions	Field inspection	Y	Periodic	1	

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	Museum of the Marine, Jacksonville, NC				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
1704.5 Masonry Construction					
Verify proportions of site prepared mortar, grout and prestressing grout for bonded tendons.	Field and submittal review	Y	Periodic	1	
Verify construction of mortar joints.	Field inspection	Y	Periodic	1	
Verify location of reinforcement and connectors, and placement of prestressing tendons and anchorages.	Field inspection	Y	Periodic	1	
Verify prestressing technique	Field inspection	N			
Verify size and location of structural masonry elements.	Field and submittal review	Y	Periodic	1	
Verify type, size, and location of anchors, including details of anchorage of masonry to structural members, frames, or other construction.	Field inspection	Y	Level 1 - Periodic	1	
		N	Level 2 - Continuous		
Verify size, grade, and type of reinforcement.	Field inspection	Y	Periodic	1	
Verify welding of reinforcing bars.	Field inspection	N	Continuous		
Verify protection of masonry during hot/cold weather.	Field inspection	Y	Periodic	1	
Verify grout space is clean prior to grouting.	Field inspection	Y	Level 1 - Periodic	1	
		N	Level 2 - Continuous		
Verify grout placement complies with code and construction document provisions.	Field inspection	Y	Continuous	1	
Testing of grout specimens, mortar specimens, and/or prisms required by construction documents	Field testing	Y	Periodic	1	
Observe preparation of prisms required by construction documents	Field inspection	Y	Continuous	1	
Verify compliance with required testing and inspection provisions of construction documents and the approved submittals.	Field testing and inspection	Y	Periodic	1	

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	Museum of the Marine, Jacksonville, NC				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
Verify grade and size of prestressing tendons and anchorages.	Field inspection	N	Periodic		
Verify proper grouting of prestressing tendons.	Field inspection	N	Continuous		
Verify application and measurement of prestressing force	Field inspection	N	Level 1 - Periodic		
		N	Level 2 - Continuous		
1704.6 Wood Construction					
Inspection of the fabrication process of wood structural elements and assemblies in accordance with Section 1704.2	In-plant review	N	Periodic		
For high-load diaphragms, verification of grade and thickness of structural panel sheathing.	Field inspection	N	Periodic		
For high-load diaphragms, verify nominal size of framing members at adjoining panel edges, nail or staple diameter and length, number of fastener lines, and that spacing between fasteners in each line and at edge margins agrees with approved bldg plans.	Field inspection	N	Periodic		
1704.7 Soils					
Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Field inspection	Y	Periodic	1	
Verify excavations are extended to proper depth and have reached proper material.	Field inspection	Y	Periodic	1	

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	Museum of the Marine, Jacksonville, NC				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
Perform classification and testing of controlled fill materials.	Field inspection	Y	Periodic	1	
Verify use of proper materials, densities, and lift thicknesses during placement and compaction of controlled fill	Field inspection	Y	Continuous	1	
Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly	Field inspection	Y	Periodic	1	
1704.8 Pile Foundations					
Verify pile materials, sizes and lengths comply with requirements.	Field inspection and submittal review.	N	Continuous		
Verify capacities of test piles and results of additional load tests, as required.	Field inspection and submittal review.	N	Continuous		
Observe pile driving operations and maintain complete and accurate records for each pile	Field inspection and submittal review. Submittal to the bldg official of the results of pile load tests.	N	Continuous		
Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, verify required penetrations to achieve design capacity, record tip and butt elevations, and document any pile damage.	Field inspection and submittal review	N	Continuous		
For steel piles, perform additional inspections per Section 1704.3	See Section 1704.3	N	See Section 1704.3		

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	Museum of the Marine, Jacksonville, NC				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
For concrete piles and concrete-filled piles, perform additional inspections per Section 1704.4.	See Section 1704.4	N	See Section 1704.4		
For specialty piles, perform additional inspections as determined by the registered design professional in responsible charge.	Field inspection	N	Periodic		
		N	Continuous		
For augered uncased piles and caisson piles, perform inspections per Section 1704.9.	See Section 1704.9	N	See Section 1704.9		
1704.9 Pier Foundations					
Observe drilling operations and verify that complete and accurate records are maintained for each pier.	Field inspection and submittal review.	N	Continuous		
Verify placement locations and plumbness, confirm pier diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable), and adequate end bearing strata capacity.	Field inspection and submittal review.	N	Continuous		
For concrete piers, perform additional inspections per Section 1704.4.	See Section 1704.4	N	See Section 1704.4		
For masonry piers, perform additional inspections per Section 1704.5.	See Section 1704.5	N	See Section 1704.5		
1704.10 Sprayed Fire-resistant Materials					
Verify surface condition preparation of structural members.	Field inspection	N	Periodic		
Verify application of sprayed fire-resistant materials.	Field inspection	N	Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	Museum of the Marine, Jacksonville, NC				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
Verify average thickness of sprayed fire-resistant materials applied to structural members.	Field inspection	N	Periodic		
Verify density of the sprayed fire-resistant material complies with approved fire-resistant design.	Field inspection and submittal review	N	Periodic		
Verify the cohesive/adhesive bond strength of the cured sprayed fire-resistant material.	Field inspection and submittal review	N	Per IBC Section 1704.10.5		
1704.11 Mastic and Intumescent Fire-Resistant Coatings					
Inspect mastic and intumescent fire-resistant coatings applied to structural elements and decks, in accordance with AWCI 12-B.	Field inspection	N	Periodic		
1704.12 Exterior Insulation and Finish Systems (EIFS)					
Verify materials, details and installations are per construction documents.	Field inspection	N	Periodic		
1704.13 Special Cases (work unusual in nature, including but not limited to alternative construction materials, unusual design applications, systems or materials with special manufacturer requirements. Attach 8 1/2x11 if needed).	Submittal review, shop inspection and/or field inspection.	N			
1704.14 Smoke Control Systems					
Leakage testing and recording of device locations prior to concealment.	Field testing	N	Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	Museum of the Marine, Jacksonville, NC				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
Prior to occupancy and after sufficient completion, pressure difference testing, flow measurements, and detection and control verification.	Field testing	N	Periodic		
1707.2 Structural Steel Special Inspections for Seismic Resistance					
Continuous inspection of structural welding in accordance with AISC 341, Seismic Provisions	Shop and field inspection	N	Continuous		
1707.3 Structural Wood Special Inspections for Seismic Resistance					
Inspection of field gluing operations of elements of the seismic-force resisting system.	Field inspection	N	Continuous		
Inspection of nailing, bolting, anchoring and other fastening of components within the seismic-force-resisting system.	Shop and field inspection	N	Periodic		
1707.4 Cold-formed Steel Framing Special Inspections for Seismic Resistance					
Inspection during welding operations of elements of the seismic-force-resisting system.	Shop and field inspection	N	Periodic		
Inspections for screw attachment, bolting, anchoring and other fastening of components within the seismic-force-resisting system.	Shop and field inspection	N	Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	Museum of the Marine, Jacksonville, NC				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
1707.5 Pier Foundations Special Inspections for Seismic Resistance					
Inspection during placement of reinforcing.	Field inspection	N	Periodic		
Inspection during placement of concrete.	Field inspection	N	Continuous		
1707.6 Storage Racks and Access Floors Special Inspections for Seismic Resistance					
Inspection during the anchorage of access floors and storage racks 8 feet or greater in height.	Field inspection	N	Periodic		
1707.7 Architectural Components Special Inspections for Seismic Resistance					
Inspection during the erection and fastening of exterior cladding and interior and exterior veneer.	Field inspection	N	Periodic		
Inspection during the erection and fastening of interior and exterior non load bearing walls.	Field inspection	N	Periodic		
1707.8 Mechanical and Electrical Components Special Inspections for Seismic Resistance					
Inspection during the anchorage of electrical equipment for emergency or standby power systems.	Field inspection	N	Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	Museum of the Marine, Jacksonville, NC				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
Inspection during the anchorage of other electrical equipment.	Field inspection	N	Periodic		
Inspection during installation of piping systems intended to carry flammable, combustible, or highly toxic contents and their associated mechanical units.	Field inspection	N	Periodic		
Inspection during the installation of HVAC ductwork that will contain hazardous materials	Field inspection	N	Periodic		
Inspection during the installation of vibration isolation systems.	Field inspection	N	Periodic		
1707.9 Designated Seismic System Verification					
Inspect and verify that the component label, anchorage or mounting conforms to the certificate of compliance in accordance with 1708.5.	Field inspection	N	Periodic		
1707.10 Seismic Isolation System					
Inspection during the fabrication and installation of isolator units and energy dissipation devices used as part of the seismic isolation system.	Shop and field inspection	N	Periodic		
1708.1 Masonry Testing and Verification for Seismic Resistance					
Certificates of compliance used in masonry construction	Review submittals	N	Each submittal		
Verification of f'_m and f'_{AAC} prior to construction	Review submittals	N	Each Submittal		
Verification of f'_m and f'_{AAC} every 5000 SF during construction	Review submittals and field testing	N	Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	Museum of the Marine, Jacksonville, NC				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
Verification of proportions of materials in mortar and grout as delivered to the site	Field review	N	Periodic		
1708.3 Reinforcing and Prestressing Steel Testing for Seismic Resistance					
Review certified mill test reports for each shipment of reinforcing steel used to resist flexural, shear and axial forces in concrete intermediate frames, special moment frames and special concrete or masonry shear walls.	Review testing reports	N	Each submittal		
Verify reinforcing steel weldability of ASTM A615 reinforcing used to resist seismic flexural and axial forces in special moment frames and shear walls	Review testing reports	N	Each submittal		
1708.4 Structural Steel Testing for Seismic Resistance					
Test In accordance with the quality assurance requirements of AISC 341, Seismic Provisions	Shop and field testing	N	Per AISC 341		
Ultrasonically test for discontinuities behind and adjacent to welds with base metal thicker than 1.5 inches where subject to through-thickness weld shrinkage strains.	Shop and field testing	N	Each occurrence		

SCHEDULE OF SPECIAL INSPECTION SERVICES																																	
PROJECT	Museum of the Marine, Jacksonville, NC																																
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT																															
		Y/N	EXTENT	AGENT*	DATE COMPLETED																												
1708.5 Seismic Qualification of Mechanical and Electrical Equipment																																	
Review certificate of compliance for designated seismic system components	Certificate of compliance review	N	Each submittal																														
1708.6 Seismically Isolated Structures																																	
Test seismic isolation system in accordance with ASCE 7 Section 17.8	Prototype testing	N	Per ASCE 7																														
<table border="1"> <thead> <tr> <th>* INSPECTION AGENTS</th> <th>FIRM</th> <th>ADDRESS</th> <th>TELEPHONE NO.</th> </tr> </thead> <tbody> <tr><td>1. to be determined</td><td></td><td></td><td></td></tr> <tr><td>2.</td><td></td><td></td><td></td></tr> <tr><td>3.</td><td></td><td></td><td></td></tr> <tr><td>4.</td><td></td><td></td><td></td></tr> <tr><td>5.</td><td></td><td></td><td></td></tr> <tr><td>6.</td><td></td><td></td><td></td></tr> </tbody> </table>						* INSPECTION AGENTS	FIRM	ADDRESS	TELEPHONE NO.	1. to be determined				2.				3.				4.				5.				6.			
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Notes: 1. The inspection and testing agent(s) shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official prior to commencing work. The qualifications of the Special Inspector(s) and/or testing agencies may be subject to the approval of the Building Official and/or the Design Professional. 2. The list of Special Inspectors may be submitted as a separate document, if noted so above. 3. Inspection of fabricators is not required where the fabricator is approved in accordance with IBC Section 1704.2.2. Encircle "Yes" or "No" as appropriate and date this document below: Are Requirements for Seismic Resistance included in the Statement of Special Inspections ? No Are Requirements for Wind Resistance included in the Statement of Special Inspections ? Yes DATE: 12/30/2011																																	

Contractor's Statement of Responsibility

Each contractor responsible for the construction or fabrication of a main wind or seismic force-resisting system, designated seismic system or wind or seismic-resisting component listed in the Statement of Special Inspections, Requirements for Seismic or Wind Resistance, must submit a Statement of Responsibility.

Project: _____

Contractor's Name: _____

Address: _____

License No.: _____

Description of building systems and components included in Statement of Responsibility:

Contractor's Acknowledgement of Special Requirements

I hereby acknowledge that I have received, read, and understand the Statement of Special Inspections and Special Inspection program:

I hereby acknowledge that control will be exercised to obtain conformance with the approved construction documents.

Name and Title (type or print)

Signature

Date

Contractor's Provisions for Quality Control

Procedures for exercising control within the contractor's organization, the method and frequency of reporting and distribution of reports is attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement

Project: _____

Address: _____

Certification Number: _____

Description of structural members and assemblies that have been fabricated:

[illegible]

Date _____

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 USE CHARGES

- A. General: Installation and removal of temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its

use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch-OD corner and pull posts, with galvanized barbed-wire top strand.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly.
- C. Electronic Communication Service: Provide a minimum of one computer in the primary field office adequate for accessing project electronic documents and maintain electronic communications. Computer shall be made accessible to Owner and Architect. Equip computers with not less than the following:
 - 1. Processor: Intel Pentium, 2.7 GHz processing speed.
 - 2. Memory: 4 gigabyte.
 - 3. Disk Storage: 300 gigabyte hard-disk drive and combination DVD-RW/CD-RW drive.
 - 4. Display: 22-inch monitor with 128 Mb dedicated video RAM.
 - 5. Network Connectivity: 10/100BaseT Ethernet.
 - 6. Productivity Software:
 - a. Microsoft Office Professional, XP or higher, including Word, Excel, and Outlook.
 - b. Adobe Reader 7.0 or higher.
 - c. WinZip 7.0 or higher.
 - 7. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.
 - 8. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 20 Mbps upload and 2 Mbps download speeds at each computer.
 - 9. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
- D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of [8] at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 77 00 - Closeout Procedures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

- E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service underground unless otherwise indicated.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel.
 - 1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine in each field office.
 - 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
 - 3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

- B. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 - 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 - 2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 31 20 00 - Earth Moving.
 - 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
 - 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 32 12 16 - Asphalt Paving.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary parking areas for construction personnel.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 - 2. Remove snow and ice as required to minimize accumulations.
- F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touchup signs so they are legible at all times.
- G. Waste Disposal Facilities: Comply with requirements specified in Section 01 74 19 - Construction Waste Management and Disposal.
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- I. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

- J. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

- J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire prevention program.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Discard or replace water-damaged and wet material.
 - 4. Discard, replace, or clean stored or installed material that begins to grow mold.
 - 5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 - Closeout Procedures.

END OF SECTION

SECTION 01 56 39
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 other 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 Sections:
 - 1. Division 01 Section "Temporary Facilities and Controls" for temporary site fencing.
 - 2. Division 31 Section "Site Clearing" for removing existing trees and shrubs.
 - 3. Division 31 Section "Earth Moving" for building and utility trench excavation, backfilling, compacting and grading requirements, and soil materials.

1.3 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape at 6 inches above the ground for trees up to, and including, 4-inch size; and 12 inches above the ground for trees larger than 4-inch 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 SUBMITTALS

- A. Qualification Data: For qualified arborist and tree service firm.
- B. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

1.5 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.

1.6 PROJECT CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. 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 in diameter; and free of weeds, roots, and toxic and other nonsoil materials.
 - 1. Obtain topsoil only from well-drained sites where topsoil is 4 inches deep or more; do not obtain from bogs or marshes.
- B. 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 hardwood, ground or shredded bark, orwood and bark chips.
 - 2. Size Range: 3 inches maximum, 1/2 inch minimum .
 - 3. Color: Natural.
- C. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements.
 - 1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft. ; remaining flexible from minus 60 to

plus 200 deg F ; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi ; 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 apart.

- a. Height: 4 feet .
- b. Color: High-visibility orange, nonfading.

- 2. Gates: Double swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width 36 inches .

- D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:

- 1. Lettering: 3-inch- high minimum, white characters on red background.

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.

3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Tie a 1-inch blue-vinyl tape around each tree trunk at 54 inches 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.
- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated.
 - 1. Apply 4-inch average thickness of organic mulch. Do not place mulch within 6 inches of tree trunks.

3.3 TREE- AND PLANT-PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
 2. Access Gates: Install ; adjust to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 50 feet on protection-zone fencing, but no fewer than four signs with each facing a different direction.
- C. Maintain protection zones free of weeds and trash.
- D. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
- E. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
 2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Division 31 Section "Earth Moving."
- B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots 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.
- 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 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.

3.5 ROOT PRUNING

- A. Prune roots that are affected by temporary and permanent construction. Prune roots 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: Do not paint cut root ends .
 - 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 Division 31 Section "Earth Moving."
- B. Root Pruning at Edge of Protection Zone: Prune roots 12 inches outside of the protection zone, by cleanly cutting all roots to the depth of the required excavation.
- C. Root Pruning within Protection Zone: Clear and excavate by hand to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

3.6 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 or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.7 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
 - 1. Submit details of proposed root cutting and tree and shrub repairs.
 - 2. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.

3. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
4. Perform repairs within 24 hours.
5. Replace vegetation 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 66 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. Plant and maintain new trees as specified in Division 32 Section "Plants."

C. Soil Aeration: Where directed by Architect, aerate surface soil compacted during construction. Aerate 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch- diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augered soil and sand.

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 01 60 00 PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. See Section 01 77 00 - Closeout Procedures for submitting warranties for Contract closeout.
- C. See Divisions 02 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.3 SUBMITTALS

- A. **Product List:** Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 2. **Form:** Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 3. **Completed List:** Within 30 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 4. **Architect's Action:** Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
- B. **Substitution Requests:** Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. **Substitution Request Form:** Use CSI Form 13.1A.
 2. **Documentation:** Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated. Provide tabular format with one column listing characteristics specified and one column listing characteristics of proposed substitution.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.

- f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Acceptance: Communication made in writing.
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
 - c. Architect reserves the right to unqualified rejection of any or all substitutions requests.
- C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: Communication made in writing.
 - b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.
 - c. Provide documentation as required for substitution requests to establish that product is comparable.
- D. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 - Submittal Procedures. Show compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
 3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 77 00 - Closeout Procedures.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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

4. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
5. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
6. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Architect may consider requests for substitution. Allow Architect 10 working days for review of request for substitution. Requests may be considered or rejected at discretion of Architect.
- B. Conditions: Architect may consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 2. Requested substitution does not require extensive revisions to the Contract Documents.
 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 4. Substitution request is fully documented and properly submitted.
 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
 7. Requested substitution is compatible with other portions of the Work.

8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

- A. Conditions: Architect may consider Contractor's request to use of a comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested. Actual samples of product with specified color and finish.

PART 3 - EXECUTION (Not Used)

END OF SECTION

**SECTION 01 73 00
EXECUTION**

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. General procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Progress cleaning.
 - 5. Starting and adjusting.
 - 6. Protection of installed construction.
 - 7. Correction of the Work.
- B. See Section 01 77 00 - Closeout Procedures for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit two copies signed by land surveyor.
- E. Final Property Survey: Submit two copies showing the Work performed and record survey data.

1.3 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

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

- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Allow a minimum of 7 calendar days for response to minor items and a minimum of 14 calendar days for major items which require additional documentation or coordination with other disciplines. Provide all necessary field dimensions and other applicable information required to prepare a response.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. Inform installers of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations by staking and marking information on stakes.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Dimensions: Dimensions marked on the Drawings shall in general be followed. Large scale drawings shall in general govern over small scale drawings. When measurements are affected by conditions already established, take measurements notwithstanding the given of dimensions in the Drawings. Do not scale the Drawings. No consideration will be given to claims based on differences between actual dimensions and those indicated on the Drawings.

- B. Identification: Owner will identify existing benchmarks, control points, and property corners.
- C. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- D. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- E. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- F. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and all new and existing utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point. Include elevations of all floors

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling

- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Section 01 40 00 - Quality Requirements.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 01 73 29 - Cutting and Patching.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 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.

1.3 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.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

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.
 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.
 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

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous construction waste.
 - 2. Recycling nonhazardous construction waste.
 - 3. Disposing of nonhazardous construction waste.

1.2 DEFINITIONS

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

1.3 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Facilitate recycling and salvage of materials.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons.
 - 4. Quantity of waste salvaged, both estimated and actual in tons.
 - 5. Quantity of waste recycled, both estimated and actual in tons.
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. LEED Submittal: LEED letter template for Credit MR 2 signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
- H. Qualification Data: For waste management coordinator.

1.6 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: LEED-Accredited Professional, certified by USGBC. Waste management coordinator may also serve as LEED coordinator.
- B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 - Project Management and Coordination.

1.7 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 2. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 3. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 4. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - 1. Distribute waste management plan to everyone concerned within [**three**] days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 2. Comply with Section 01 50 00 - Temporary Facilities and Controls, for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 4. Store components off the ground and protect from the weather.
 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING CONSTRUCTION WASTE

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

B. Wood Materials:

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

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

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

3.4 DISPOSAL OF WASTE

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

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

B. Burning: Do not burn waste materials.

C. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

D. Disposal: Remove waste materials and dispose of at designated spoil areas on Owner's property.

E. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.2 SUBSTANTIAL COMPLETION

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

or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

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

1.5 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. 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. Use cleaning agents on the interior of the facility that are low VOC, and will maintain the indoor air quality, as prescribe by LEED. 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: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Coordinate cleaning agents and processes to maintain indoor air quality within limits established by USGBC and designated for this Project.
- C. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

- a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to unusual operating conditions.
 - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - r. Leave Project clean and ready for occupancy.
- D. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- E. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous

materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
- C. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS**2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS**

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.
- B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- C. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Architect.
 - 7. Name and contact information for Commissioning Authority.
 - 8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 - 9. Cross-reference to related systems in other operation and maintenance manuals.
- D. 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.
- E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily

navigated file tree. Configure electronic manual to display bookmark panel on opening file.

2.2 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.
 - 3. Gas leak.
 - 4. Water leak.
 - 5. Power failure.
 - 6. Water outage.
 - 7. System, subsystem, or equipment failure.
 - 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.
 - 4. Required sequences for electric or electronic systems.
 - 5. Special operating instructions and procedures.

2.3 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 - 2. Performance and design criteria if Contractor is delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.

8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

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

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

2.4 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.

2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recording, if available.

- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- 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. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
- F. Comply with Section 01 77 00 - Closeout Procedures, for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up record prints.
 - 2. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints and one set of file prints.
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned record prints and three set(s) of prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

PART 2 - PRODUCTS

2.1 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. Record data as soon as possible after obtaining it.
 - c. Record and check the markup before enclosing concealed installations.
 2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

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

2.3 MISCELLANEOUS RECORD SUBMITTALS

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

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

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

END OF SECTION

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.2 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.

1.3 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 - Quality Requirements, experienced in operation and maintenance procedures and training.

1.4 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 content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS**2.1 INSTRUCTION PROGRAM**

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 - 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.

- e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 1. Schedule training with Owner with at least seven days' advance notice.
- C. 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.

END OF SECTION

SECTION 01 81 13 - SUSTAINABLE DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to pursue LEED Silver certification based on USGBC's "LEED 2009 for New Construction & Major Renovations."
 - 1. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
 - 2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
 - 3. A copy of the LEED Project checklist is attached at the end of this Section for information only.
 - 4. Specific requirements for LEED are also included in other Sections.

1.2 DEFINITIONS

- A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
- B. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- C. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
 - 2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Respond to questions and requests from Architect and the USGBC regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the USGBC has made its determination on the project's LEED certification application. Document responses as informational submittals.

1.4 ACTION SUBMITTALS

A. LEED Documentation Submittals:

1. Credit MR 4: Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating cost for each product having recycled content.
2. Credit MR 5: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
3. Credit IEQ 3.1:
 - a. Construction indoor-air-quality management plan.
 - b. Product data for temporary filtration media.
 - c. Product data for filtration media used during occupancy.
 - d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.
4. Credit IEQ 3.2:
 - a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
 - b. Product data for filtration media used during flush-out and during occupancy.
 - c. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.
5. Credit IEQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used.
6. Credit IEQ 4.2: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used.
7. Credit IEQ 4.4: Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

1.5 INFORMATIONAL SUBMITTALS

- A. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:
 - 1. Plumbing.
 - 2. Mechanical.
 - 3. Electrical.
- B. LEED Action Plans: Provide preliminary submittals within 30 days of date established for the Notice to Proceed indicating how the following requirements will be met:
 - 1. Credit MR 4: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
 - 2. Credit MR 5: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
- C. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.

2.2 RECYCLED CONTENT OF MATERIALS

- A. Credit MR 4: Building materials shall have recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content for Project constitutes a minimum of **20** percent of cost of materials used for Project.
 - 1. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
 - 2. Do not include plumbing, mechanical and electrical components, and specialty items such as equipment in the calculation.

2.3 REGIONAL MATERIALS

- A. Credit MR 5: Not less than 20 percent of building materials (by cost) shall be regional materials.

2.4 LOW-EMITTING MATERIALS

- A. Credit IEQ 4.1: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Metal-to-Metal Adhesives: 30 g/L.
3. Adhesives for Porous Materials (Except Wood): 50 g/L.
4. Subfloor Adhesives: 50 g/L.
5. Plastic Foam Adhesives: 50 g/L.
6. Carpet Adhesives: 50 g/L.
7. Carpet Pad Adhesives: 50 g/L.
8. VCT and Asphalt Tile Adhesives: 50 g/L.
9. Cove Base Adhesives: 50 g/L.
10. Gypsum Board and Panel Adhesives: 50 g/L.
11. Rubber Floor Adhesives: 60 g/L.
12. Ceramic Tile Adhesives: 65 g/L.
13. Multipurpose Construction Adhesives: 70 g/L.
14. Fiberglass Adhesives: 80 g/L.
15. Contact Adhesive: 80 g/L.
16. Structural Glazing Adhesives: 100 g/L.
17. Wood Flooring Adhesive: 100 g/L.
18. Structural Wood Member Adhesive: 140 g/L.
19. Single-Ply Roof Membrane Adhesive: 250 g/L.
20. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
21. Top and Trim Adhesive: 250 g/L.
22. Plastic Cement Welding Compounds: 250 g/L.
23. ABS Welding Compounds: 325 g/L.
24. CPVC Welding Compounds: 490 g/L.
25. PVC Welding Compounds: 510 g/L.
26. Adhesive Primer for Plastic: 550 g/L.
27. Sheet-Applied Rubber Lining Adhesive: 850 g/L.
28. Aerosol Adhesive, General Purpose Mist Spray: 65 percent by weight.
29. Aerosol Adhesive, General Purpose Web Spray: 55 percent by weight.
30. Special Purpose Aerosol Adhesive (All Types): 70 percent by weight.
31. Other Adhesives: 250 g/L.
32. Architectural Sealants: 250 g/L.
33. Nonmembrane Roof Sealants: 300 g/L.
34. Single-Ply Roof Membrane Sealants: 450 g/L.
35. Other Sealants: 420 g/L.
36. Sealant Primers for Nonporous Substrates: 250 g/L.

37. Sealant Primers for Porous Substrates: 775 g/L.
 38. Modified Bituminous Sealant Primers: 500 g/L.
 39. Other Sealant Primers: 750 g/L.
- B. Credit IEQ 4.2: For field applications that are inside the weatherproofing system, paints and coatings shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Flat Paints and Coatings: VOC not more than 50 g/L.
 2. Nonflat Paints and Coatings: VOC not more than 150 g/L.
 3. Dry-Fog Coatings: VOC not more than 400 g/L.
 4. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
 7. Pretreatment Wash Primers: VOC not more than 420 g/L.
 8. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
 9. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
 10. Floor Coatings: VOC not more than 100 g/L.
 11. Shellacs, Clear: VOC not more than 730 g/L.
 12. Shellacs, Pigmented: VOC not more than 550 g/L.
 13. Stains: VOC not more than 250 g/L.
- C. Credit IEQ 4.4: Composite wood, agrifiber products, and adhesives shall not contain urea-formaldehyde resin.

PART 3 - EXECUTION

3.1 MEASUREMENT AND VERIFICATION

- A. Credit EA 5: Implement measurement and verification plan consistent with Option B: Energy Conservation Measure Isolation or Option D: Calibrated Simulation, Savings Estimation Method 2 in the EVO's "International Performance Measurement and Verification Protocol (IPMVP), Volume III: Concepts and Options for Determining Energy Savings in New Construction."
- B. If not already in place, install metering equipment to measure energy usage. Monitor, record, and trend log measurements.
- C. Evaluate energy performance and efficiency by comparing actual to predicted performance.
- D. Measurement and verification period shall cover at least one year of postconstruction occupancy.

3.2 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

- A. Credit IEQ 3.1: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."
1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 015000 "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
 2. Replace all air filters immediately prior to occupancy.
- B. Credit IEQ 3.2:
1. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 deg F and a relative humidity no higher than 60 percent.
 - a. As indicated
 2. Air-Quality Testing:
 - a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "Green Building Design and Construction Reference Guide."
 - b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:
 - 1) Formaldehyde: 27 ppb.
 - 2) Particulates (PM10): 50 micrograms/cu. m.
 - 3) Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
 - 4) 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
 - 5) Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.
 - c. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting noncomplying building areas, take samples from same locations as in the first test.
 - d. Air-sample testing shall be conducted as follows:
 - 1) All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
 - 2) Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings

- such as workstations and partitions are encouraged, but not required, to be in place for the testing.
- 3) Number of sampling locations varies depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.
 - 4) Air samples shall be collected between 3 and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.

END OF SECTION

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	D/C	Y / N / ?		Yes	Credit Title	Responsible Party
SUSTAINABLE SITES			POSSIBLE POINTS: 11	5		
Prereq 1	C	Y		0	Construction Activity Pollution Prevention	Pro Construction
Credit 4.3	D	Y	3	3	Alternative Transportation- Low emitting	EDA
Credit 5.2	D	Y	1	1	Site Development - Maximize Open Space	EDA
Credit 7.2	D	Y	1	1	Heat Island Effect - Roof	CJMW Arch
WATER EFFICIENCY			POSSIBLE POINTS: 11	3		
Prereq 1	D	Y		0	Water Use Reduction	ASW Plumbing
Credit 3	D	Y	2	2	Water Use Reduction (30%)	ASW Plumbing
	D	Y	1	1	Water Use Reduction (35%)	ASW Plumbing
ENERGY & ATMOSPHERE			POSSIBLE POINTS: 37	18		
Prereq 1	C	Y		0	Fundamental Commissioning of Building Energy Systems	CxA
Prereq 2	D	Y		0	Minimum Energy Performance	ASW Elec.
Prereq 3	D	Y		0	Fundamental Refrigerant Management	ASW Mech
Credit 1.1	D	Y	1	1	Optimize Energy Performance (12%)	ASW Electrical
	D	Y	1	1	Optimize Energy Performance (14%)	ASW Electrical
	D	Y	1	1	Optimize Energy Performance (16%)	ASW Electrical
	D	Y	1	1	Optimize Energy Performance (18%)	ASW Electrical
	D	Y	1	1	Optimize Energy Performance (20%)	ASW Electrical
	D	Y	1	1	Optimize Energy Performance (22%)	ASW Electrical
	D	Y	1	1	Optimize Energy Performance (24%)	ASW Electrical
	D	Y	1	1	Optimize Energy Performance (26%)	ASW Electrical
	D	Y	1	1	Optimize Energy Performance (28%)	ASW Electrical
	D	Y	1	1	Optimize Energy Performance (30%)	ASW Electrical
	D	Y	1	1	Optimize Energy Performance (32%)	ASW Electrical
	D	Y	1	1	Optimize Energy Performance (34%)	ASW Electrical
	D	Y	1	1	Optimize Energy Performance (36%)	ASW Electrical
	D	Y	1	1	Optimize Energy Performance (38%)	ASW Electrical
Credit 3	C	Y	2	2	Enhanced Commissioning	CxA
Credit 4	D	Y	2	2	Enhanced Refrigerant Management	ASW Mechanical
MATERIALS & RESOURCES			POSSIBLE POINTS: 14	7		
Prereq 1	D	Y		0	Storage and Collection of Recyclables	CJMW Arch
Credit 2	C	Y	1	1	Construction Waste Mgmt (50%)	Pro Construction
	C	Y	1	1	Construction Waste Mgmt (75%)	Pro Construction
Credit 4	C	Y	1	1	Recycled Content (10%)	Pro Construction
	C	Y	1	1	Recycled Content (20%)	Pro Construction
Credit 5	C	Y	1	1	Regional Materials (10%)	Pro Construction
	C	Y	1	1	Regional Materials (20%)	Pro Construction
Credit 7	C	Y	1	1	Certified Wood (50%)	Pro Construction

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INDOOR ENV. QUALITY			POSSIBLE POINTS: 17	16		
Prereq 1	D	Y		0	Minimum Indoor Air Quality Performance	ASW Mechanical
Prereq 2	D	Y		0	Environmental Tobacco Smoke (ETS) Control	CJMW / Owner
Credit 1	D	Y	1	1	Outdoor Air Delivery Monitoring	ASW Mechanical
Credit 3.1	C	y	1	1	Construction Indoor Air Quality Management Plan - During Construction	Pro Construction
Credit 3.2	C	Y	1	1	Construction Indoor Air Quality Management Plan - Before Occupancy	Pro Construction
Credit 4.1	C	Y	1	1	Low-Emitting Materials - Adhesives and Sealants	Pro Construction
Credit 4.2	C	Y	1	1	Low-Emitting Materials - Paints and Coatings	Pro Construction
Credit 4.3	C	Y	1	1	Low-Emitting Materials - Flooring Systems	Pro Construction
Credit 4.4	C	Y	1	1	Low-Emitting Materials - Composite Wood and Agrifiber Products	Pro Construction
Credit 5	D	Y	1	1	Indoor Chemical and Pollutant Source Control	CJMW / ASW Mechanical
Credit 6.1	D	Y	1	1	Controllability of Systems - Lighting	ASW Elec
Credit 6.2	D	Y	1	1	Controllability of Systems - Thermal Comfort	ASW Mechanical
Credit 7.1	D	Y	1	1	Thermal Comfort - Design	ASW Mechanical
Credit 7.2	D	y	1	1	Thermal Comfort - Verification	Owner
Credit 8.1	D	Y	1	1	Daylight and Views - Daylight (75%)	CJMW Arch
Credit 8.2	D	Y	3	3	Daylight and Views - Views (90%)	CJMW Arch
INNOVATION IN DESIGN			POSSIBLE POINTS: 6	7		
Credit 1.1	D	Y	1	1	Credit Name - Innovation - education	CJMW / Owner
Credit 1.2	D	Y	2	2	Credit Name - Exemplary Performance - design	CJMW
Credit 1.3	C	Y	1	1	Credit Name - Exemplary Performance	Pro Construction
Credit 1.4	C	Y	1	1	Credit Name - Exemplary Performance	Pro Construction
Credit 1.5	C	Y	1	1	Credit Name - Exemplary Performance	Pro Construction
Credit 2	C	Y	1	1	LEED® Accredited Professional	CJMW Arch
REGIONAL PRIORITY			POSSIBLE POINTS: 4	2		
Credit 1.4	C	Y	1	1	Regional Priority	ASW Elec
Credit 1.6	C	Y	1	1	Regional Priority	ASW Mech
TOTAL				58	Certified 40-49 Points/ Silver 50-59 Points/ Gold 60-79 Points/	

Yes

Exemplary Performance Option

NOTES:

1. Only change the Y / N / ? Column. Point values will switch automatically
2. Regional Priority Credits must be reassigned based on project (See tab below for RPCs based on Zip)

Certification Level Based on Current Points

Certified
Silver
Gold
Platinum

SECTION 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. OPR and BoD documentation are included by reference for information only.

1.2 SUMMARY

- A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.
- B. Commissioning is systematic processes to provide documented confirmation that building systems perform according to the criteria set forth in the design intent and satisfy the owner's operational needs. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.
- C. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
 - 1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
 - 2. Verify and document proper performance of equipment and systems.
 - 3. Verify that O&M documentation left on site is complete.
 - 4. Verify that the Owner's operating personnel are adequately trained.
- D. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.
- E. Abbreviations._ The following are common abbreviations used in the *Specifications* and in the *Commissioning Plan*. Definitions are found in Section 1.3.

A/E- Architect and design
engineers

GC- General contractor (prime)

CxA-	Commissioning authority	MC-	Mechanical contractor
CC	Controls contractor	OR-	Owner's Representative
		PC-	Prefunctional checklist
Cx-	Commissioning	PM-	Project manager (of the Owner)
Cx Plan-	Commissioning Plan document	Subs-	Subcontractors to General
EC-	Electrical contractor	TAB-	Test and balance contractor
FT-	Functional performance test		

F. Related Sections:

- 1. Division 22 Section "Commissioning of Plumbing" for commissioning process activities for plumbing systems, assemblies, equipment, and components.***
- 2. Division 23 Section "Commissioning of HVAC" for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.***
- 3. Division 26 Section "Commissioning of Electrical Systems" for commissioning process activities for integrated automation systems, assemblies, equipment, and components.***

1.3 DEFINITIONS

- Acceptance Phase.** Phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.
- Approval.** Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.
- Architect/Engineer (A/E):** The prime consultant (architect) and sub-consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.
- BoD:** Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- CxA:** Commissioning Authority. An independent agent, not otherwise associated with the A/E team members or the Contractor, hired by the Owner. The CxA directs and coordinates the day-to-day commissioning activities. The CxA does not take an oversight role like the OR. The CxA shall report directly to the OR.

- F. Cx Plan: Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process
- G. Datalogging: Monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.
- H. Deferred Functional Tests : FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.
- I. Deficiency : A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent)
- J. Design Intent: A dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.
- K. Design Narrative or Design Documentation: Sections of either the Design Intent or Basis of Design.
- L. Factory Testing: Testing of equipment on-site or at the factory by factory personnel with an Owner's representative present.
- M. Functional Performance Test (FT): Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FTs are performed after prefunctional checklists and startup are complete.
- N. General Contractor (GC): The prime contractor for this project. Generally refers to all the GC's subcontractors as well. Also referred to as the Contractor, in some contexts.
- O. Indirect Indicators: Indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed

- P. Manual Test: Using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the “observation”).
- Q. Monitoring: The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.
- R. Non-Compliance: See Deficiency.
- S. Non-Conformance: See Deficiency.
- T. Over-written Value: Writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also “Simulated Signal.”
- U. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- V. Prefunctional Checklist (PC): A list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CxA to the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Prefunctional checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the prefunctional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional checklisting, except for larger or more critical pieces of equipment.
- W. Sampling: Functionally testing only a fraction of the total number of identical or near identical pieces of equipment.
- X. Seasonal Performance Tests: FT that are deferred until the system(s) will experience conditions closer to their design conditions.
- Y. Simulated Condition: Condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

- Z. Simulated Signal: Disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.
- AA. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.
- BB. Startup: The initial starting or activating of dynamic equipment, including executing prefunctional checklists.
- CC. Subs: The subcontractors to the GC who provide and install building components and systems.
- DD. Test Procedures: The step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CxA.
- EE. Test Requirements: Requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents
- FF. Trending: Monitoring using the building control system.
- GG. Vendor: Supplier of equipment.
- HH. Warranty Period: Warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.4 COORDINATION

- A. **Commissioning Team.** The members of the commissioning team consist of the Commissioning authority (CxA), the Owner's Representative (OR), the General Contractor (GC or Contractor), the architect and design engineers (particularly the mechanical engineer), the Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the Controls Contractor (CC), any other installing subcontractors or suppliers of equipment. If known, the Owner's building or plant operator/engineer is also a member of the commissioning team.
- B. **Management.** The CxA is hired by the Owner directly. The CxA directs and coordinates the commissioning activities and the reports to the OR. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.
- C. **Scheduling.** The CxA will work with the OR and GC according to established protocols to schedule the commissioning activities. The CxA will provide sufficient notice to the OR and GC for scheduling commissioning activities. The GC will

integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

- D. The CxA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The *Commissioning Plan—Construction Phase* provides a format for this schedule. As construction progresses more detailed schedules are developed by the CxA. The Commissioning Plan also provides a format for detailed schedules.

1.5 COMMISSIONING PROCESS

- A. **Commissioning Plan.** The commissioning plan provides guidance in the execution of the commissioning process. Just after the initial commissioning scoping meeting the CxA will update the plan which is then considered the “final” plan, though it will continue to evolve and expand as the project progresses. The *Specifications* will take precedence over the *Commissioning Plan*.
- B. **Commissioning Process.** The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.
 - 1. Commissioning during construction begins with a scoping meeting conducted by the CxA where the commissioning process is reviewed with the commissioning team members.
 - 2. Additional meetings will be required throughout construction, scheduled by the CxA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
 - 3. Equipment documentation is submitted to the CxA during normal submittals, including detailed start-up procedures.
 - 4. The CxA works with the Subs in developing startup plans and startup documentation formats, including providing the Subs with prefunctional checklists to be completed, during the startup process.
 - 5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with prefunctional checklists being completed before functional testing.
 - 6. The Subs, under their own direction, execute and document the prefunctional checklists and perform startup and initial checkout. The CxA documents that the checklists and startup were completed according to the approved plans. This may include the CxA witnessing start-up of selected equipment.
 - 7. The CxA develops specific equipment and system functional performance test procedures. The Subs review the procedures.
 - 8. The procedures are executed by the Subs, under the direction of, and documented by the CxA.

9. Items of non-compliance in material, installation or setup are corrected at the Sub's expense and the system retested.
10. The CxA reviews the O&M documentation for completeness.
11. Commissioning is completed before Substantial Completion.
12. The CxA reviews, pre-approves and coordinates the training provided by the Subs and verifies that it was completed.
13. Deferred testing is conducted, as specified or required.

1.6 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, the Owner's Representative (OR) and representatives of the Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
- B. Members Appointed by Owner:
 1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
 2. Representatives of the facility user and operation and maintenance personnel.
 3. The Owners Representative.
 4. Architect and engineering design professionals.

1.7 OWNER'S RESPONSIBILITIES

- A. Work with the CxA and Contractor to develop the OPR documentation for information and use.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.
- C. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.
- D. Follow the Commissioning Plan.
- E. Attend commissioning scoping meetings and additional meetings as necessary.

1.8 OWNERS REPRESENTATIVE'S RESPONSIBILITIES

- A. The Owner's Representative OR shall represent the Owner during the commissioning process as follows:
1. Manage the contract of the A/E, CxA, OR and Contractor.
 2. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions according to the *Commissioning Plan – Construction Phase*.
 3. Provide final approval for the completion of the commissioning work.
 4. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.
 5. Follow the Commissioning Plan.
 6. Attend commissioning scoping meetings and additional meetings as necessary.

1.9 ARCHITECT/ENGINEERS (AE) RESPONSIBILITIES

- A. The AE shall participate in and perform commissioning process activities including, but not limited to, the following:
1. Attend the commissioning scoping meeting and selected commissioning team meetings.
 2. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted.
 3. Provide any design narrative and sequence documentation requested by the CxA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
 4. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
 5. Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.
 6. Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning.
 7. Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during commissioning during warranty-period commissioning.
 8. Furnish a copy of all construction documents, addenda, requests for information, change orders and approved submittals and shop drawings related to commissioned equipment to the CxA.

1.10 CONSTRUCTION MANAGER'S (CM) RESPONSIBILITIES (N/A)

1.11 CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
3. Attend commissioning team meetings held as required.
4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review commissioning progress and deficiency reports.
6. Review and accept construction checklists provided by the CxA.
7. Complete paper or electronic construction checklists as Work is completed and provide to the CxA on a weekly basis.
8. Review and accept commissioning process test procedures provided by the Commissioning Authority.
9. Complete commissioning process test procedures.
10. Include the cost of commissioning in the total contract price.
11. Coordinate the training of Owner personnel and provide the times and dates of training to the CxA.
12. Execute seasonal or deferred functional performance testing witnessed by the CxA to facilitate the Cx process.
13. Provide a list of final settings, setpoints, ranges, schedules, and / or trend logs required by the CxA.
14. Follow the Commissioning Plan.
15. Attend commissioning scoping meetings and additional meetings as necessary.
16. From the red-line drawings, edit and update one-line diagrams developed as part of the design narrative documentation and those provided by the vendor as shop drawings for the chilled and hot water, condenser water, domestic water, steam and condensate systems; supply, return and exhaust air systems and emergency power system.

1.12 SUB CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.

2. Assist in equipment testing per agreements with Prime.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone data logging equipment that may be used by the CxA.
4. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
5. Review test procedures for equipment installed by factory representatives.
6. Follow the Commissioning Plan.
7. Attend commissioning scoping meetings and additional meetings as necessary.

1.13 EQUIPMENT SUPPLIERS RESPONSIBILITIES

- A. The equipment suppliers shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
 1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
 2. Assist in equipment testing per agreements with Subs.
 3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone datalogging equipment that may be used by the CxA.
 4. Through the contractors they supply products to, analyze specified products and verify that the designer has specified the newest most updated equipment reasonable for this project's scope and budget.
 5. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
 6. Review test procedures for equipment installed by factory representatives.
 7. Follow the Commissioning Plan.
 8. Attend commissioning scoping meetings and additional meetings as necessary.

1.14 CxA'S RESPONSIBILITIES

- A. The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxA may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E. The primary role of the CxA is to develop and coordinate the execution of a testing plan, observe and document performance—that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the CxA.

1. Coordinates and directs the commissioning activities using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
2. Coordinate the commissioning work and, with the GC and OR, ensure that commissioning activities are being scheduled into the master schedule.
3. Revise, as necessary, the *Commissioning Plan—Construction Phase*.
4. Plan and conduct a commissioning scoping meeting and other commissioning meetings.
5. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
6. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
7. Review and comment on normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
8. Write and distribute prefunctional tests and checklists.
9. Develop an enhanced start-up and initial systems checkout plan with Subs.
10. Perform site visits, as necessary, to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
11. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's representative of any deficiencies in results or procedures.
12. Witness all or part of any ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's representative of any deficiencies in results or procedures.
13. Approve prefunctional tests and checklist completion by reviewing prefunctional checklist reports and by selected site observation and spot checking.
14. Approve systems startup by reviewing start-up reports and by selected site observation.
15. Review TAB execution plan.
16. Oversee sufficient functional testing of the control system and approve it to be used for TAB, before TAB is executed.
17. Approve air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
18. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone datalogger monitoring or manual functional testing. Submit to OR for review, and for approval if required.

19. Analyze any functional performance trend logs and monitoring data to verify performance.
20. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
21. Maintain a master deficiency and resolution log and a separate testing record. Provide the OR with written progress reports and test results with recommended actions.
22. Witness performance testing of smoke control systems by others and all other owner contracted tests or tests by manufacturer's personnel over which the CxA may not have direct control. Document these tests and include this documentation in Commissioning Record in O&M manuals.
23. Review equipment warranties to ensure that the Owner's responsibilities are clearly defined.
24. Oversee and approve the training of the Owner's operating personnel.
25. Compile and maintain a commissioning record and building systems book(s).
26. Review and approve the preparation of the O&M manuals.
27. Provide a final commissioning report.
28. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
29. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

1.15 SYSTEMS TO BE COMMISSIONED

A. The following checked systems will be commissioned in this project.

Equipment and Systems	Functional Test Requirements Specified In:	Equipment and System	Functional Test Requirements Specified In:
<u>HVAC System</u>		<u>Electrical System</u>	
<u>X</u> VAV Boxes	23 99 50 thru 23 99 53	<u>X</u> Sweep or scheduled lighting controls	26 99 50 thru 26 99 53
<u>X</u> Pumps	23 99 50 thru 23 99 53	<u>X</u> Daylight dimming controls	26 99 50 thru 26 99 53
<u>X</u> Air cooled condenser	23 99 50 thru 23 99 53	<u>X</u> Lighting Controls	26 99 50 thru 26 99 53
<u>X</u> Boilers	23 99 50 thru 23 99 53	<u>Plumbing System</u>	
<u>X</u> Piping systems	23 99 50 thru 23 99 53	<u>X</u> Service water heaters	22 08 01 and 23 99 50 thru 23 99 53
<u>X</u> Ductwork	23 99 50 thru 23 99 53	<u>X</u> Service water booster pumps	22 08 01 and 23 99 50 thru 23 99 53
<u>X</u> Variable frequency drives	23 99 50 thru 23 99 53	<u>X</u> Mixing/tempering valves	22 08 01 and 23 99 50 thru 23 99 53
<u>X</u> Air handlers	23 99 50 thru 23 99 53	<u>X</u> Fixtures including sensors	22 08 01 and 23 99 50 thru 23 99 53
<u>X</u> Humidifiers	23 99 50 thru 23 99 53	<u>X</u> Solar hot water system	22 08 01 and 23 99 50 thru 23 99 53
<u>X</u> Energy Recovery Ventilator	23 99 50 thru 23 99 53	<u>Other</u>	
<u>X</u> Testing, Adjusting and Balancing work	23 99 50 thru 23 99 53		
<u>X</u> Chemical treatment systems	23 99 50 thru 23 99 53		
<u>X</u> HVAC control system	23 99 50 thru 23 99 53		
<u>X</u> Fire and smoke dampers	23 99 50 thru 23 99 53		

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities. Two-way radios shall be provided by the Division Contractor.
- B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site, except for stand-alone datalogging equipment that may be used by the CxA.
- C. Datalogging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the Owner.
- D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the *Specifications*. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.
- E. Refer to Section 019113, Part 3.6 E for details regarding equipment that may be required to simulate required test conditions.

PART 3 - EXECUTION

3.1 MEETINGS

- A. Scoping Meeting. Within 90 days of commencement of construction, the CxA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CxA. Information gathered from this meeting will allow the CxA to revise the *Commissioning Plan* to its "final" version, which will also be distributed to all parties.
- B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CxA as construction progresses. These meetings will cover coordination, deficiency resolution

and planning issues with particular Subs. The CxA will plan these meetings and will minimize unnecessary time being spent by Subs. These meetings may be as required, until the final 3 months of construction, when they may be held as frequently as one per week.

3.2 REPORTING

- A. The CxA will provide regular reports to the OR, with increasing frequency as construction and commissioning progresses. Standard forms are provided and referenced in the *Commissioning Plan*.
- B. The CxA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.
- C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.
- D. A final summary report (about four to six pages, not including backup documentation) by the CxA will be provided to the OR, focusing on evaluating commissioning process issues and identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the summary report. Prefunctional checklists, functional tests and monitoring reports will not be part of the final report, but will be stored in the Commissioning Record in the O&M manuals.
- E. The sample reports included in Appendix-B are to provide contractors with an example of a format and an indication of the rigor of the required documentation for various report types. They were not developed for this project.

3.3 SUBMITTALS

- A. The CxA will provide appropriate contractors with a specific request for the type of submittal documentation the CxA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum, the request will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning authority. All documentation requested by the CxA will be included by the Subs in their O&M manual contributions.

1. Requested Submittals:

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- a. Air Handling Units*
 - b. Building Automation*
 - c. Boiler*
 - d. Domestic Water Heaters*
 - e. Exhaust Fans*
 - f. Energy Recovery Ventilator*
 - g. Hot Water Heating Coils*
 - h. Lighting Controls*
 - i. Pumps*
 - j. Service Water Heaters*
 - k. Testing, Adjusting, and Balancing*
 - l. Variable Frequency / Variable Speed Drives*
 - 2. Requested Shop Drawings:
 - a. Building Distribution Piping*
 - b. Ductwork*
 - c. Lighting Control System*
 - B. The Commissioning authority will review and provide comment on submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The Commissioning authority will notify the OR, Owner Representative, or A/E as requested, of items missing or areas that are not in conformance with Contract Documents and which require resubmission.
 - C. The CxA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.
 - D. These submittals to the CxA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, though the CxA will review and approve them.
 - E. Contractor's responsibility for deviations in submittals from requirements of the Contract Documents is not relieved by the Commissioning Authority's review.
- 3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT**
- A. The following procedures apply to all equipment to be commissioned, according to Section 1.15, Systems to be Commissioned. Some systems that are not comprised so much of actual dynamic machinery, e.g., electrical system power quality, may have very simplified PCs and startup.
 - B. **General.** Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing
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(in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

- C. **Start-up and Initial Checkout Plan.** The CxA shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for prefunctional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements in Sections **130800, 220800, 230800, and 260800.**

1. The CxA develops prefunctional checklists and procedures. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.
2. These checklists and tests are provided by the CxA to the Contractor. The Contractor determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form will have more than one trade responsible for its execution.
3. The subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining (or adding to) the CxA's checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan. The full start-up plan could consist of something as simple as:
 - a. The CxA's prefunctional checklists.
 - b. The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
 - c. The manufacturer's normally used field checkout sheets.
4. The subcontractor submits the full startup plan to the CxA for review and approval.
5. The CxA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.
6. The full start-up procedures and the approval form may be provided to the OR for review and approval, depending on management protocol.

D. **Sensor and Actuator Calibration.**

1. All field-installed temperature, relative humidity, CO, CO₂ and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be

- calibrated using the methods described below. Alternate methods may be used, if approved by the Owner before-hand. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed *in* the unit at the factory with calibration certification provided need not be field calibrated.
2. All procedures used shall be fully documented on the prefunctional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.
 3. Sensor Calibration Methods.
 - a. All Sensors. Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure. Tolerances for critical applications may be tighter.
 - b. Sensors without Transmitters--Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.
 - c. Sensors with Transmitters--Standard Application. Disconnect sensor. Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and BAS control panel. Using manufacturer's resistance-temperature data simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the BAS. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.
 - d. Critical Applications. For critical applications (process, manufacturing, etc.) more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

Tolerances, Standard Applications

<u>Sensor</u>	<u>Required Tolerance (+/-)</u>	<u>Sensor</u>	<u>Required Tolerance (+/-)</u>
Cooling coil, chilled and condenser water temps	0.4F	Flow rates, water	4% of design
AHU wet bulb or dew point	2.0F	Relative humidity	4% of design
Hot water coil and boiler water temp	1.5F	Combustion flue temps	5.0F
Outside air, space air, duct air temps	0.4F	Oxygen or CO ₂ monitor	0.1 % pts
Watthour, voltage & amperage	1% of design	CO monitor	0.01 % pts
Pressures, air, water and gas	3% of design	Natural gas and oil flow rate	1% of design
Flow rates, air	10% of design	Steam flow rate	3% of design
		Barometric pressure	0.1 in. of Hg

4. **Valve and Damper Stroke Setup and Check.**

- a. EMS Readout. For all valve and damper actuator positions checked, verify the actual position against the BAS readout.
- b. Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions. If actual valve or damper position doesn't reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

5. **Closure for heating coil valves (NO):** Set heating setpoint 20°F above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set heating setpoint to 20°F below room temperature. Observe the valve close. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.

6. **Closure for cooling coil valves (NC):** Set cooling setpoint 20°F above room temperature. Observe the valve close. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set cooling setpoint to 20°F below room temperature. Observe valve open. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.

E. Execution of Prefunctional Checklists and Startup.

1. Four weeks prior to startup, the Subs and vendors schedule startup and checkout with the OR, GC and CxA. The performance of the prefunctional checklists, startup and checkout are directed and executed by the Sub or vendor. When checking off prefunctional checklists, signatures may be required of other Subs for verification of completion of their work.
2. The CxA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as approved by the OR). In no case will the number of units witnessed be less than four on any one building, nor less than 20% of the total number of identical or very similar units.
3. For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the CxA shall observe a sampling of the prefunctional and start-up procedures. The sampling procedures are identified in the commissioning plan.
4. The Subs and vendors shall execute startup and provide the CxA with a signed and dated copy of the completed start-up and prefunctional tests and checklists.
5. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

F. Deficiencies, Non-Conformance and Approval in Checklists and Startup.

1. The Subs shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CxA within two days of test completion.
2. The CxA reviews the report and submits either a non-compliance report or an approval form to the Sub. The CxA shall work with the Subs and vendors to correct and retest deficiencies or uncompleted items. The CxA will involve the OR and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CxA as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CxA recommends approval of the execution of the checklists and startup of each system to the OR using a standard form.
3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in back charges to the responsible party. Refer to Part 3.7 herein for details.

3.5 PHASED COMMISSIONING

- A. The project will not require startup and initial checkout to be executed in phases.

3.6 FUNCTIONAL PERFORMANCE TESTING

- A. This sub-section applies to all commissioning functional testing for all divisions.
- B. The general list of equipment to be commissioned is found in Section 019113, Part 1.15.
- C. The parties responsible to execute each test are listed with each test in Sections **220800, 230800, and 26080.**
- D. **Objectives and Scope.** The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.
 - 1. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested. Specific modes required in this project are given in Sections **220800, 230800, and 260800.**
 - 2. Development of Test Procedures. Before test procedures are written, the CxA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements in Sections **220800, 230800, and 260800.**
 - 3. The CxA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test, shall provide limited assistance to the CxA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CxA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CxA may submit the tests to the A/E for review, if requested.
 - 4. The CxA shall review owner-contracted, factory testing or required owner acceptance tests which the CxA is not responsible to oversee, including

documentation format, and shall determine what further testing or format changes may be required to comply with the Specifications. Redundancy of testing shall be minimized.

5. The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.

E. Test Methods.

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers. Sections **220800, 230800, and 260800** specify which methods shall be used for each test. The CxA may substitute specified methods or require an additional method to be executed, other than what was specified, with the approval of the OR. This may require a change order and adjustment in charge to the Owner. The CxA will determine which method is most appropriate for tests that do not have a method specified.
2. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
3. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
5. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55F, when the outside air temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current outside air temperature.
6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control

system represent actual conditions and responses. Much of this verification is completed during prefunctional testing.

7. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.
8. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. The specific recommended sampling rates are specified with each type of equipment in Sections **220800**, **230800**, and **260800**. It is noted that no sampling by Subs is allowed in prefunctional checklist execution.

- a. A common sampling strategy referenced in the *Specifications* as the “xx% Sampling—yy% Failure Rule” is defined by the following example.

xx = the percent of the group of identical equipment to be included in each sample.

yy = the percent of the sample that if failing, will require another sample to be tested.

- b. The example below describes a 20% Sampling—10% Failure Rule.

- 1) Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the “first sample.”
- 2) If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
- 3) If 10% of the units in the second sample fail, test all remaining units in the whole group.
- 4) If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CxA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.

- F. **Coordination and Scheduling.** The Subs shall provide sufficient notice to the CxA regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CxA will schedule functional tests through the OR, GC

and affected Subs. The CxA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

1. In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CxA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

- G. **Test Equipment.** Refer to Section 019113, Part 2 for test equipment requirements.
- H. **Problem Solving.** The CxA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the GC, Subs and A/E.

3.7 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

- A. **Documentation.** The CxA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the OR for review and approval and to the Subs for review. The CxA will include the filled out forms in the O&M manuals.

B. Non-Conformance.

1. The CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the OR on a standard non-compliance form.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the OR.
4. As tests progress and a deficiency is identified, the CxA discusses the issue with the executing contractor.
 - a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:
 - 1) The CxA documents the deficiency and the Sub's response and intentions and they go on to another test or sequence. After the day's work, the CxA submits the non-compliance reports to the OR for

- signature, if required. A copy is provided to the Sub and CxA. The Sub corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CxA.
- 2) The CxA reschedules the test and the test is repeated.
- b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
- 1) The deficiency shall be documented on the non-compliance form with the Sub's response and a copy given to the OR and to the Sub representative assumed to be responsible.
 - 2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Project Manager.
 - 3) The CxA documents the resolution process.
 - 4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CxA. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.

5. Cost of Retesting.

- a. The cost for the *Sub* to retest a prefunctional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.
 - b. For a deficiency identified, not related to any prefunctional checklist or start-up fault, the following shall apply: The CxA and OR will direct the retesting of the equipment once at no "charge" to the GC for their time. However, the CxA's time for a second retest will be charged to the GC, who may choose to recover costs from the responsible Sub.
 - c. The time for the CxA and OR to direct any retesting required because a specific *prefunctional* checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the GC, who may choose to recover costs from the party responsible for executing the faulty prefunctional test.
 - d. Refer to the sampling section of Section 019113, Part 3.6 for requirements for testing and retesting identical equipment.
6. The Contractor shall respond in writing to the CxA at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
 7. The CxA retains the original non-conformance forms until the end of the project.

8. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.

C. **Failure Due to Manufacturer Defect.** If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the OR. In such case, the Contractor shall provide the Owner with the following:

1. Within one week of notification from the OR, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the OR within two weeks of the original notice.
2. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
3. The OR will determine whether a replacement of all identical units or a repair is acceptable.
4. Two examples of the proposed solution will be installed by the Contractor and the OR will be allowed to test the installations for up to one week, upon which the OR will decide whether to accept the solution.
5. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

D. **Approval.** The CxA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CxA and by the OR, if necessary. The CxA recommends acceptance of each test to the OR using a standard form. The OR gives final approval on each test using the same form, providing a signed copy to the CxA and the Contractor.

3.8 DEFERRED TESTING

- A. **Unforeseen Deferred Tests.** If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the OR. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.
- B. **Seasonal Testing.** During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this

contract. The CxA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and as-builds due to the testing will be made.

3.9 TRAINING OF OWNER PERSONNEL

- A. The GC shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.
- B. The CxA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.
 - 1. The CxA shall interview the facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Owner and CxA shall decide how rigorous the training should be for each piece of commissioned equipment. The CxA shall communicate the results to the Subs and vendors who have training responsibilities.
In addition to these general requirements, the specific training requirements of Owner personnel by Subs and vendors are specified in Division **22, 23, and 26**.
 - 2. Each Sub and vendor responsible for training will submit a written training plan to the CxA for review and approval prior to training. The plan will cover the following elements:
 - a. Equipment (included in training)
 - b. Intended audience
 - c. Location of training
 - d. Objectives
 - e. Subjects covered (description, duration of discussion, special methods, etc.)
 - f. Duration of training on each subject
 - g. Instructor for each subject
 - h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
 - i. Instructor and qualifications
 - j. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
 - 3. The CxA develops an overall training plan and coordinates and schedules, with the OR and GC, the overall training for the commissioned systems. The CxA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CxA recommends approval of the training to the OR using a standard form. The OR also signs the approval form at one of the training sessions, the CxA presents a one hour presentation discussing the use of the blank functional test forms for re-commissioning

equipment. Video recording of the training sessions will be provided by the Trade Contractor with media cataloged by the CxA and added to the O&M manuals.

4. The mechanical design engineer shall at the first training session present the overall system design concept and the design concept of each equipment section. This presentation shall be one to two hours in length and include a review of all systems using the simplified system schematics (one-line drawings) including chilled water systems, condenser water or heat rejection systems, heating systems, fuel oil and gas supply systems, supply air systems, exhaust system and outside air strategies.

3.10 OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals.

1. The specific content and format requirements for the standard O&M manuals are detailed in Section **017823**.
2. Contractor shall submit two draft copies of the complete operating and maintenance manual to the OR for review by the architect/engineer and CxA within 60 calendar days after review of equipment shop drawings. One copy will be returned to the contractor within 30 days after receipt by the A/E.
3. Contractor shall submit corrected final approved manuals prior to substantial completion. Prior to final submittal, the CxA shall review the O&M manuals (in addition to the initial draft O&M manual), and documentation, with redline as-builts, for systems that were commissioned to verify compliance with the specifications. The CxA will communicate, through the OR, deficiencies in the manuals to the contractor or A/E, as requested. Upon a successful review of the corrections, the CxA will recommend approval and acceptance of these sections of the O&M manuals to the OR. The CxA will also review each equipment warranty and verify that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.
4. A/E Contribution. The A/E will include in the beginning of the O&M manuals a separate section describing the systems including:
 - a. The design intent narrative prepared by the A/E and provided as part of the bid documents, updated to as-built status by the A/E.
 - b. Simplified professionally drawn single line system diagrams on 8 ½" x 11" or 11" x 17" sheets. These shall include chillers, water system, condenser water system, heating system, supply air systems, exhaust systems and electrical distribution system. These shall show major pieces of equipment such as pumps, chillers, boilers, control valves, expansion tanks, coils, service valves, switchboards, motor control centers, panel boards, etc.

5. CxA Review and Approval. Prior to substantial completion, the CxA shall review the O&M manuals, documentation and redline as-builds *for systems that were commissioned* to verify compliance with the *Specifications*. The CxA will communicate deficiencies in the manuals to the OR or A/E, as requested. Upon a successful review of the corrections, the CxA recommends approval and acceptance of these sections of the O&M manuals to the OR or A/E. The CxA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.

B. Commissioning Record in O&M Manuals.

1. The CxA is responsible to compile, organize and index the following commissioning data by equipment into labeled, indexed and tabbed, three-ring binders and deliver it to the GC, to be included with the O&M manuals. Three copies of the manuals will be provided. The format of the manuals shall be:

Tab I-1 Commissioning Plan

Tab I-2 Final Commissioning Report (see (B.2) below)

Tab 01 System Type 1 (chiller system, packaged unit, boiler system, etc.)

Sub-Tab A Design narrative and criteria, sequences, approvals for Equipment 1

Sub-Tab B Startup plan and report, approvals, corrections, blank prefunctional checklists
Colored Separator Sheets—for each equipment type (fans, pumps, chiller, etc.)

Sub-Tab C Functional tests (completed), trending and analysis, approvals and corrections, training plan, record and approvals, blank functional test forms and a recommended recommissioning schedule.

Tab 02 System Type 2.....repeat as per System 1

2. Final Report Details. The final commissioning report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the commissioning authority regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas: 1) Equipment meeting the equipment specifications, 2) Equipment installation, 3) Functional performance and efficiency, 4) Equipment documentation and design intent, and 5) Operator training. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency

section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

3. Other documentation will be retained by the CxA

3.11 WRITTEN WORK PRODUCTS

- A. The commissioning process generates a number of written work products described in various parts of the *Specifications*. The *Commissioning Plan—Construction Phase*, lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them and the location of the specification to create them. In summary, the written products are:

<u>Product</u>	<u>Developed By</u>
1. Final commissioning plan	CxA
2. Cx meeting minutes	CxA
3. Commissioning schedules	CxA with GC
4. Equipment documentation submittals	Subs
5. Sequence clarifications	Subs and A/E as needed
5. Prefunctional checklists	CxA
6. Startup and initial checkout plan	Subs and CxA (compilation of existing documents)
7. Startup and initial checkout forms filled out	Subs
8. Final TAB report	TAB
9. Issues log (deficiencies)	CxA
10. Commissioning Progress Record	CxA
11. Deficiency reports	CxA
12. Functional test forms	CxA
13. Filled out functional tests	CxA
14. O&M manuals	Subs
15. Commissioning record book	CxA
16. Overall training plan	CxA and OR
17. Specific training agendas	Subs
18. Final commissioning report	CxA
19. Misc. approvals	CxA

END OF SECTION 01 91 13

SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in-place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

1.2 QUALITY ASSURANCE

- A. Codes and Standards: Comply with all applicable provisions of state and local building and safety codes, as well as other codes and standards referenced in this specification, except where more stringent requirements are shown or specified herein. These include:
 - 1. ACI 301-08 "Specifications for Structural Concrete for Buildings".
 - 2. ACI 318-08 "Building Code Requirements for Reinforced Concrete".
 - 3. ACI SP-4 "Formwork for Concrete".
 - 4. ACI SP-15 "Field reference Manual", provide copy in field office.
 - 5. ACI SP-66 "Detailing Manual for Reinforced Concrete."
 - 6. CRSI "Manual of Standard Practice" latest edition.
 - 7. AWS D1.4 "Structural Welding Code - Reinforcing Steel".
- B. Inspection and Testing: Owner will employ, at his expense, an Independent Testing Laboratory (ITL) to perform quality assurance program which will include, but not be limited to the following testing and reports:
 - 1. Verify that concrete operations are performed and concrete is placed and consolidated according to referenced standards.
 - 2. Sampling Fresh Concrete: Secure random samples in accordance with ASTM C-172.
 - a. Slump - ASTM C-143; one (1) test for each concrete load at point of discharge; one (1) test for each set of compressive strength test specimens.
 - b. Air Content - ASTM C-173; volumetric method for air-entrained normal weight concrete; ASTM C-231; one (1) for each of compressive strength test specimens.
 - c. Concrete Temperature - For each load, at time of arrival, at point of discharge, test hourly when air temperature is 40 degrees F and below, and 80 degrees F and above; and each time a set of compression test specimens are made.
 - d. Unit Weight: Determine unit weight of lightweight concrete for each strength test in accordance with ASTM C 567.
 - 3. Compression Test Specimens - ASTM C-31; one (1) set of five (5) standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field cured test specimens are taken.

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- a. When cold weather conditions occur, as defined in this specification, two (2) additional standard cylinders are required for each complete set of test specimens. These two cylinders shall be field cured, at a location determined by the ITL.
 - b. Contractor shall be responsible for storage, temperature control, and protection of specimens while at site. ITL shall be responsible for handling and transportation of specimens.
 4. Compressive Strength Tests - ASTM C-39; one (1) set of Compression Test Specimens for each 100 c.y. or fraction thereof, of each concrete class placed in any one (1) day or for each 10,000 s.f. surface area placed; one (2) specimen tested at seven (7) days, two (2) specimens tested at twenty-eight (28) days.
 - a. When frequency of testing will provide less than three (3) strength tests for a given class of concrete, conduct testing from at least three (3) randomly selected batches or from each batch if fewer than three (3) are used.
 - b. When total quantity of a given class of concrete is less than 50 c.y. strength test may be waived by Structural Engineer.
 - c. When cold weather field cured specimens are required, transport and test one specimen with companion laboratory cured specimen and test remaining field cured specimen with companion laboratory cured specimens at 28 days.
 - d. When strength of field-cured cylinders is less than eighty-five per cent (85%) of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing in-place concrete.
 - e. Strength level of concrete will be considered satisfactory if averages of sets of three (3) consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.
 5. Concrete Test Reports: Record of test results of fresh concrete samples should contain the following:
 - a. Name of concrete testing service
 - b. Project identification name and number
 - c. Date of concrete placement
 - d. Concrete type and class
 - e. Location of concrete batch in structure
 - f. Design compressive strength in 28 days
 - g. Concrete mix proportions and materials
 - h. Compressive breaking strength of each cylinder
 - i. Unit weight of concrete
 - j. Type of break for both 7 day test and 28 day tests.
 6. Concrete Batch Trip Tickets: Collected and retained by Contractor. Compressive and slump tests shall be identified by reference to particular trip ticket. Concrete batch trip ticket shall contain information specified in ASTM C-94, paragraph "Batch Ticket Information". Ticket shall clearly show amount of water for entire batch, which may be added in the field that will not exceed water/cement ratio specified by the design mix. Report site additions of water to all concrete.

7. Every concrete field-testing technician working on the project shall have a minimum certification by the American Concrete Institute as Concrete Field Testing Technician – Grade 1.
- C. Cast-in-place Concrete work is subject to Special Inspections in conformance with Chapter 17 of the North Carolina Building Code. Refer to the “Statement of Special Inspections” for scope of testing work and identification of responsible agents.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data with application and installation instructions for proprietary materials and items, including but not limited to forming components for exposed-to-view concrete walls, admixtures, patching compounds, epoxies, grouts, waterstops, joint systems, curing compounds and any others requested by Architect or Structural Engineer.
- B. Substitutions: Any request for product substitution shall be submitted for review, with all necessary documentation, a minimum of ten (10) days prior to time of bid.
- C. LEED Submittals:
 1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
- D. Concrete Mix Designs: Submit concrete mix designs for each class of concrete to be used including mixes for pumpable concrete, where used. The concrete mix designs shall conform to the requirements of this specification and ACI 318 and ACI 301. Mix designs prepared more than twelve (12) months prior to the date submitted for review, are not acceptable. The concrete mix designs shall be submitted 15 days before starting concrete work. Materials and admixtures proposed in mix design shall be the same as those materials, which will be used in the production mix. Do not proceed with concrete production until the Structural Engineer has accepted the mixes.
- E. Fly Ash Certification: Submit Materials Certification for each supplier furnishing fly ash showing the fly ash meets the specified restrictions.
- F. Reinforcement Shop Drawings: Submit drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI detailing manual (SP-66) showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of reinforcement. Include all accessories specified or required to support reinforcing and any special reinforcement required for openings through concrete structures.
 1. Shop drawings shall be reviewed by Contractor prior to submission. Drawings shall bear Contractor's approval stamp accepting quantities, coordination with other trades, and responsibility for coordination of dimensions shown in the Contract Documents.

- G. Formwork Shop Drawings: Submit drawings indicating layout and details of formwork for exposed-to-view concrete walls.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with exterior grade overlaid plywood, wood or metal-framed or other acceptable panel-type materials with liners that provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and conform to joint system where shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
1. Use overlaid plywood complying with U.S. Product Standard PS-1; High Density Overlaid, "HDO PLYFORM" Concrete Form. Use only new panels at the beginning of project.
 2. Apply a light application of releasing agent for stripping forms.
 3. Formwork joints shall be firm and even without edges.
 4. Form ties shall leave no metal closer than 1½" to any exposed-to-view surface or 1" for stainless steel ties. Do not fit with lugs, cones, washers or other devices without approval of the architect. Tie holes shall be filled or sealed.
- B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns and Supports: Steel, fiberglass-reinforced plastic, or fiber tubes of laminated plies with water-resistant adhesive and wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist loads imposed by wet concrete without deformation.
- D. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
- E. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide ties that will leave no metal closer than one inch to exposed surface. Provide ties that, when removed, will leave holes no larger than one-inch diameter in concrete surface.

2.2 REINFORCING MATERIALS

- A. Reinforcing Steel: ASTM A 615 Grade 60 deformed.
- B. Smooth Steel Wire: ASTM A 82, Grade 70 where indicated for use in columns or other elements as spiral reinforcing.

- C. Deformed Steel Wire: ASTM A 496, Grade 70 deformed, where noted for use in masonry joints as column or pilaster reinforcing bar ties.
- D. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.
- E. Smooth Dowels: ASTM A 306, Grade 80.
- F. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric or mat in place. Use wire bar type supports complying with CRSI specifications.
 - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs. Supports of solid brick or masonry are not acceptable for use in slabs on grade.
 - 2. For exposed to view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel (CRSI, Class 2).

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I, unless otherwise acceptable to the Structural Engineer. Type III may be used when approved by the Structural Engineer. Use one brand of cement throughout project, unless acceptable to the Architect or Structural Engineer.
- B. Fly Ash: ASTM C 618, Type F, but not exceeding 4% loss on ignition. Fly ash shall meet the physical restrictions on uniformity shown in Table 2 of ASTM C618. The amount of fly ash shall not exceed 20% of cement content by weight. Substitution shall be at a rate of 1.2 pounds of fly ash per pound of concrete. Fly ash used shall be from one source throughout the project. Fly ash is subject to testing at the concrete plant by the Owner's testing agency at the request of the Structural Engineer. Fly ash is not accepted before receipt of fly ash material certification by Structural Engineer.
- C. Normal Weight Aggregates: ASTM C 33, and as herein specified; provide aggregates from a single source for exposed concrete. For exterior exposed surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.
 - 1. Aggregate shall be No. 57 or No. 67 stone for all concrete except No. 8 stone (or equivalent) shall be provided for grout fill in masonry bond beams, pockets and vertical cells.
- D. Lightweight Aggregates: ASTM C 330; saturated "Solite", "Stalite" expanded shale aggregate produced by rotary kiln method.
- E. Water: Drinkable.
- F. Admixtures (General): Provide admixtures for concrete that contains not more than 0.1% chloride ions. Calcium chloride and thiocyanates are not permitted. Admixtures used shall be certified to be compatible with other admixtures.
- G. Water Reducing Admixture: ASTM C 494, Type A.

- H. Water Reducing, Accelerating Admixture: ASTM C 494, Type E.
- I. Water Reducing, Retarding Admixture: ASTM C 494, Type D.
- J. Air Entraining Admixture: ASTM C 260.
- K. Mid-Range Water Reducing Admixture (MRWR): ASTM C 494, Type A or F.
- L. High Range Water Reducing Admixture (HRWR): ASTM C 494, Type G.

2.4 CURING & SEALING COMPOUNDS

- A. Liquid Membrane Forming Curing Compound: ASTM C309, Type 1, Class A, clear styrene acrylate type, 30% solids content minimum. Maximum moisture loss shall not exceed 0.055 grams/sq.cm. when applied at coverage rate of 200 s.f./gallon. Manufacturer's certification required.
- B. Dissipating Resin Curing Compounds: Conform to ASTM C 309, Type 1-D. Film must chemically break down in two to four week period.

2.5 RELATED MATERIALS

- A. Bonding Compound: Polyvinyl acetate or acrylic base, for use in non-structural repairs. Subject to compliance, one of following:
 - 1. Polyvinyl Acetate (Interior Only).
 - 2. Acrylic or Styrene Butadiene.
- B. Epoxy Adhesives: ASTM C 881 100% solids, 100% reactive, two (2) component material suitable for use in structural repairs, on dry or damp surfaces.
- C. Patching/Leveling Mortar: Free flowing, polymer modified cementitious coating for use in floor slab repairs.
- D. Underlayment Compounds: Free flowing, self leveling, pumpable, cementitious base compound. .
- E. Absorptive Cover: Burlap cloth from jute or kenaf, approximately 9 oz./sq. yd., AASHTO M 182, Class 2.
- F. Moisture-Retaining Cover: One (1) of the following, complying with ASTM C 171:
 - 1. Waterproof paper.
 - 2. Polyethylene film.
 - 3. Polyethylene-coated burlap.
- G. Waterstops: Square type bentonite at construction joints and other joints as indicated; size to suit joints. "Volclay Water Stop RX" by the American Colloid Company.

- H. Reglets: Where resilient or elastomeric sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 26 gage galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.
- I. Vapor Barrier: Provide polyethylene sheet vapor barrier cover over prepared base material where indicated. Use only materials resistant to decay when tested in accordance with ASTM E 154.
- J. Non-Shrink Grout: Pre-mixed, non-corrosive, non-metallic, non-staining containing selected silica sands, Portland cement, shrinkage compensating and water reducing agents. Product shall require only addition of water and comply with requirements of CRD-C621-80. Minimum compressive strength when tested according to ASTM C-109 per manufacturers maximum allowable water content - 2500 psi after one day; 7000 psi after twenty-eight (28) days.
- K. Fiber Joint Filler: Preformed strips of asphalt saturated fiberboard, complying with ASTM D1751.

2.6 PROPORTIONING AND DESIGN OF MIXES

- A. Contractor is responsible for preparation of design mixes for each class of concrete used in construction. Use an independent testing facility acceptable to Architect for design, preparation and reporting proposed mix designs. Any concrete mixes designed specifically to be pumped shall be submitted for review.
 - 1. All mix designs shall be proportioned in accordance with Section 5.3, Proportioning on Basis of Field Experience or Trial Mixtures, or Both" of ACI 318-05. If trial batches are used, mix design shall be prepared by an independent testing laboratory and achieve a compressive strength 1200 psi higher than specified strength.
 - 2. Mix Adjustments: Contractor may request mix adjustments when characteristics of materials, project conditions, weather, test results, or other circumstances warrant. Laboratory test reports for revised mix designs and strength results must be submitted to Structural Engineer and reviewed before using in work.
- B. Unit Weight of Lightweight Concrete: Lightweight concrete shall have an air-dry unit weight not exceeding 115 lbs/ft³ as determined by ASTM C567. Coarse aggregate for lightweight concrete shall be 100% lightweight aggregate.
- C. Admixtures: Use specified water-reducing admixture, mid-range or high-range water-reducing admixture in all concrete.
 - 1. All pumped concrete shall contain specified MRWR or HRWR. All water reducers shall only be plant added. Concrete containing MRWR or HRWR shall be considered a separate class of concrete requiring a concrete mix design submittal in conformance with this specification.
 - 2. All cast-in-place concrete for formed concrete walls shall include specified HRWR.
 - 3. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2% within the following limits.

Maximum Aggregate Size	Total Air Content

1-1/2"	4.5%
1"	4.5%
3/4"	5.0%
1/2"	5.5%

- D. Water-Cement Ratio: All concrete subjected to freezing and thawing, including exterior sidewalks, stairs and pavements, shall have maximum water-cement ratio of 0.45. Quantity of cement used in calculating W-C ratio shall be cement plus fly ash.
- E. Slump Limits: All concrete containing specified HRWR or MRWR shall have a maximum slump of 8" for normal weight concrete and 6" for lightweight concrete. All other concrete shall have a nominal slump of 4". Slump samples shall be taken at point of discharge from chute except for pumped concrete, which shall be taken from point of discharge at end of hose.

PART 3 - EXECUTION

3.1 FORMWORK

- A. General: Design, erect, support, brace, and maintain formwork to support vertical and lateral static and dynamic loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.
1. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back up at joints to prevent leakage of cement paste.
 2. Align vertical control and construction joints with form edge joints in exposed-to-view walls.
 3. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and for easy removal.
 4. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
 5. Form ties to be factory-fabricated, adjustable-length, removable, or snap-off metal designed to prevent form deflection and spalling concrete surfaces upon removal.
- B. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

- C. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing before concrete placement as required to prevent mortar leaks and maintain proper alignment.
- D. Preparation of Form Surfaces: Coat contact surfaces of forms with a non-residual, low VOC, form-coating compound and/or re-coat surfaces of re-used forms. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in strict accordance with manufacturer's instructions.
- E. Earth Formed Elements: Footings and slab turndowns may be formed by excavation provided earth will stand upright after vertical cuts. Dewater, clean and level bottoms of excavations receiving concrete.
- F. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.
- G. Screed Supports for Slabs on Steel Deck: Set screed supports over steel beam lines. Screed supports shall not be supported off of steel deck within the span between steel beam lines.
- H. Vapor Barrier: Lap joints 6" minimum.

3.2 REMOVAL OF FORMS AND SUPPORTS

- A. Formwork Not Supporting Weight of Concrete: Sides of beams, walls, columns and similar parts of work may be removed after cumulatively curing at not less than 50 degree F for twenty-four (24) hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained until concrete attains at least 75% of required 28-day strength.
 - 1. Formwork Supporting Weight of Concrete: Beams, soffits, joists, slabs, and other structural elements, shall not be removed in less than fourteen (14) days or until concrete has attained at least 75% of the design minimum compressive strength at twenty-eight (28) days, but in no case less than 3000 psi. Determination of compressive strength of in place concrete may be by testing field-cured specimens representative of concrete location or members or by other means of early concrete strength evaluation satisfactory to the Structural Engineer.
 - 2. For post-tensioned slabs, do not remove formwork until slab stressing is complete and the stressing records are approved by the structural engineer.
- B. Form Facing Materials: May be removed four (4) days after placement or shorter periods where results of concrete strength tests provide satisfactory results and only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

- C. Minimum Curing Period: Curing and protection procedures shall be continued after removal of formwork and facing materials as prescribed in ACI 347 Section 3.6.2.3 and with regard for concrete admixtures and temperature conditions. Shorter periods may be acceptable to the Structural Engineer where results of concrete strength tests permit. In no case shall any curing period be less than 48 hours. Where exposure to temperatures of less than 40 degrees F occurs, minimum required curing period shall be increased by the length of time of the exposure below that temperature.

3.3 CONCRETE REINFORCEMENT

- A. Fabrication and Delivery: Fabricate reinforcing as detailed with indicated sizes. Cut, bend and form to required lengths, shapes and assemblies without causing damage or kinks to the reinforcing steel. Reinforcement shall not be heated for the purpose of bending the bars.
 - 1. Bundle and tag reinforcement with information to identify reinforcing for proper placing. Transport to and store at site to avoid damaging or covering reinforcing with grease, mud, or other deleterious materials.
- B. Placing Reinforcement: Comply with CRSI recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports, and as herein specified.
 - 1. Clean reinforcement of loose rust and mill scale, mud, dirt, dust, ice, and other materials that reduce or destroy bond with concrete.
 - 2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
 - 3. Place reinforcement to obtain no less than the minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
 - 4. Install welded wire fabric in longest lengths practicable. Lap adjoining pieces at least one and one-half (1-1/2) full mesh and lace splices with wire.
 - 5. Place specified vapor barrier as indicated on the drawings, prior to placing steel for slabs on grade.

3.4 SPLICES

- A. General: Splice reinforcing steel only at locations as indicated on the drawings. Other splice locations may be approved by the Structural Engineer.
- B. Lap Splices: Full contact lap splices are required for all reinforcing where lap splices are indicated, unless detailed otherwise on the drawings.
 - 1. Refer to the drawings for splice lap lengths required for each bar size and for each concrete strength and density.
- C. Welded Splices: Welding of reinforcing steel is prohibited unless explicitly detailed on the drawings or approved in writing by the Structural Engineer.

1. Where permitted, welding shall conform to AWS D1.4 "Structural Welding Code - Reinforcing Steel". Reinforcing steel conforming to ASTM A-706 or deformed bar anchors conforming to ASTM A-496 is required in all locations where manual or machine welding is to be performed.
2. Welding of all other reinforcing steels is prohibited except for "Cadweld" tension splices as specified. "Tack" welding of reinforcing is prohibited in any and all cases.

3.5 JOINTS

- A. Construction Joints: Locate construction joints not shown on drawings, so as not to impair strength and appearance of structure, as acceptable to Architect. For elevated flatwork, locate in center one-third of spans unless indicated otherwise on the drawings.
 1. Provide keyways at least 1-1/2" deep in construction joints in walls and footings as well as between walls and footings.
 2. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints.
- B. Waterstops: Provide waterstops in construction joints as indicated; install to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Field fabricate joints in waterstops in accordance with manufacturer's printed instructions.
- C. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slab-on-grade as indicated in the drawings at points of contact between slabs and vertical surfaces, such as column pedestals and foundation walls.
- D. Control (Contraction) Joints in Slabs-on-Grade: Construct control joints in slab-on-grade to form panels of patterns as shown in the drawings.
 1. Form control joints by inserting approved plastic strip into fresh concrete until top surface of strip is flush with slab surface. Prior to concrete being floated, remove top section of insert and clean groove of loose debris.
 2. Saw cuts shall be made within 24 hours after slab finishing without dislodging aggregate.
 3. Slab on grade construction and control joints shall be filled with specified Slab-on-Grade Joint Filler where indicated on drawings. Slabs shall cure 60 days minimum prior to filling.

3.6 INSTALLATION OF EMBEDDED ITEMS

- A. Set and build into work anchorage devices and other embedded items required for other work attached to, or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto. Tolerance for anchor bolts and other embedded items as follows:
 1. 1/8" center to center of any two (2) bolts within anchor bolt group, where anchor bolt group is defined as "set" of anchor bolts, which receive single fabricated steel shipping piece.

2. 1/4" center to center of adjacent anchor bolt groups.
 3. Maximum accumulation of 1/4" per 100' along established column line of multiple anchor bolt groups, but not exceed total of 1" where established column line is actual field line representative of centers of as-built anchor bolt along line of columns.
 4. 1/4" from center of any bolt group to established column line through that group.
- B. Tolerance specified above apply to offset dimensions shown on plans, measured parallel and perpendicular to nearest established column line for individual columns shown on plans to be offset from established column lines. Unless shown otherwise, anchor bolts are set perpendicular to theoretical bearing surface.
- C. Reglets: Install to receive top edge of foundation sheet waterproofing where occurs and to receive thru-wall flashing in outer face of concrete frame at exterior walls where flashing is indicated on the drawings at lintels, relieving angles and other conditions.

3.7 CONCRETE MIXES

- A. Ready-Mix Concrete: Comply with requirements of ANSI/ASTM C 94, and as herein specified. Delete references for allowing additional water to be added to batch for material with insufficient slump.
1. Adjustments to concrete shall not be made at the construction site for any reason including addition of mix water. All mix materials shall be incorporated together at the point of batching.
- B. Mixing and Delivery Time: When air temperature is between 85 degree F and 90 degree F, reduce mixing and delivery time from 1-1/2 hours to seventy-five (75) minutes; when air temperature is above 90 degrees F, reduce mixing and delivery time to sixty (60) minutes. During other conditions contributing to rapid setting of concrete, shorter mixing time than specified in ASTM C-94 may be required.
1. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 50 degrees F nor more than 80 degrees F at any time during mixing, transporting or placing. Do not use frozen materials or materials containing ice or snow. Do not use materials containing antifreeze agents or chemical accelerators unless accepted in mix designs by the Architect/Engineer.
- C. Concrete Batch Tickets: Collected and retained by Contractor, with copies provided to ITL. Concrete batch tickets shall contain all information specified in ASTM C-94, paragraph "Batch Ticket Information" and including project identification name and number and time at point of batch discharge. Ticket shall also clearly show amount of water for entire batch, which may be added in field that will not exceed water/cement ratio specified by design mix and the amount of water actually added in the field, if any. Field addition of water to mix is only permitted when verified and reported by Owner's testing lab that addition of water does not bring concrete water/cement ratio above approved design mix.
- D. Job-Site Mixing: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one (1) cu. yd., or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than five (5) minutes after ingredients are in mixer, before any part of batch is

released. For mixers of capacity larger than one cu. yd., increase minimum 1-1/2 minutes to mixing time by fifteen (15) seconds for each additional cu. yd., or fraction thereof.

1. Make record by batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix, type, mix time, quantity, and amount of water introduced. Job-site mixing shall only be used for incidental work and with the approval of the structural engineer.

3.8 CONCRETE PLACEMENT

- A. Placement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Coordinate installation of joint materials and moisture barriers with placement of forms and reinforcing steel. Placement shall comply with ACI 301.
- B. General: Placement shall comply with ACI 301 "Specification for Structural Concrete for Buildings" and with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.
 1. Deposit concrete continuously or in layers. No concrete shall be placed on concrete, which has hardened sufficiently to cause formation of seams or planes of weakness. Provide construction joints as shown on the drawings and/or as herein specified where concrete cannot be placed continuously. Deposit concrete as near as practicable to its final location to avoid segregation.
- C. Placing Concrete in Forms: Deposit concrete in forms in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
- D. Consolidating Placed Concrete: Use mechanical vibrating equipment supplemented by hand spading, rodding or tamping. Use equipment and procedures for consolidation in accordance with ACI 309 "Standard Practice for Consolidation of Concrete".
 1. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than is visibly effective for the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into preceding layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing degradation of concrete mix.
 2. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 3. Maintain reinforcing in proper position during all placing operations.
- E. Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints until placing of a panel or section is completed. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of rises or depressions. Do not disturb slab surfaces prior to beginning finishing operations.

- F. Concrete Footings: Footings and other foundations shall be placed only on certified compacted fill or approved undisturbed subgrade as noted on the drawings. Footings shall not be loaded until concrete has reached a minimum of 75% of specified strength. Construction joints are not permitted in individual column footings.
- G. Concrete Walls: Maximum length of wall pours shall not exceed seventy-five linear feet (75'-0") in any single pour. Chamfered and doweled construction joints shall be placed between pours as shown on the drawings. Horizontal construction joints are not permitted unless detailed or shown on the drawings. Location of all proposed construction joints shall be approved by the Architect prior to detailing of reinforcing. Exterior faces of walls shall be true to line to receive other work. Waterstops shall be provided when indicated on the drawings. Vertical control joints shall be spaced a maximum of twenty-five feet (25'-0") and shall be chamfered as shown on the drawings.
- H. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified. Cold weather conditions are defined as a mean daily temperature of less than 40 degrees F for three (3) successive days. When temperatures of more than 50 degrees F occur during more than half of any 24-hour period, conditions are no longer regarded as requiring cold weather placing.
 - 1. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain concrete mixture temperature of not less than 50 degrees F and nor more than 80 degrees F, at point of placement. Do not use frozen material or material containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 2. Where placement will occur under cold weather conditions, two (2) additional test cylinders are required. Refer to "Testing and Inspection" in this specification section.
- I. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
 - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degree F. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.
 - 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete. Fog spray forms, reinforcing steel and subgrade thoroughly before placing concrete.

3.9 FINISH OF FORM SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed to view in finish work or concealed by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched; and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

- B. Smooth Form Finish: For formed concrete surfaces exposed to view, or to be covered with coating material applied directly to concrete, or covering material applied directly to concrete, such as waterproofing, dampproofing, parging or other similar system. This is as-cast concrete surface obtained with selected overlaid form facing material, arranged orderly and symmetrically with minimum of seams. Repair and patch defective areas and fins or other projections completely removed and smoothed only at architect's direction and approval.
- C. Smooth Rubbed Finish: Provide this finish for all exposed concrete surfaces scheduled to receive paint, including epoxy paint.
 - 1. Moisten concrete surfaces and rub with carborundum brick or other abrasive until uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.
- D. Grout Cleaned Finish: Provide for all smooth form finished surfaces.
 - 1. Combine one part portland cement to 1-1/2 parts fine sand by volume, and mix with water to consistency of thick paint. Proprietary additives may be used at Contractor's option. Blend standard portland cement and white portland cement, amounts determined by trial patches, so that final color of dry grout will match adjacent surfaces.
 - 2. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.
- E. Related Unformed Surfaces: At tops of walls and horizontal offsets at surfaces occurring 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 MONOLITHIC SLAB FINISHES

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.
 - 1. After placing slabs, plane surface to a tolerance for floor flatness F_f of not less than 15 and floor levelness F_l of not less than 13. Slope surfaces uniformly to drains where required. After leveling and before final set, roughen surface with stiff brushes, brooms, or rakes.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified; slab surfaces to be covered with membrane or elastic waterproofing or sand-bed pavers.
 - 1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or

inaccessible to power units. Check and level surface plane to a tolerance for floor flatness $F_f 18$ and floor levelness F_l of not less than 15. Cut down high spots. Uniformly slope surfaces to drains. Immediately after leveling, re-float surface to a uniform, smooth, granular texture.

- C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed to view, and slab surfaces with resilient flooring, carpet, tile, paint or other thin film finish coating system. After floating, begin first trowel finish operation using power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, with surface plane tolerance of $F_f 20$ and $F_l 17$. Grind smooth surface defects, which would telegraph through applied floor covering system.
- D. Trowel and Fine Broom Finish: Apply trowel and fine broom finish where ceramic or quarry tile is to be installed with thin-set mortar. Apply trowel finish as specified, then immediately follow with fine brooming to slightly scarify surface.
- E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps, ramps and elsewhere as indicated. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- F. Sealer/Dustproofer Finish: Apply a second coat of specified clear styrene acrylate type curing/sealing compound to all exposed interior concrete floors where indicated on drawings. Compound shall be applied in strict accordance with directions of manufacturer and just prior to completion of construction.

3.11 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Keep continuously moist for not less than seven (7) days. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven (7) days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by liquid membrane curing, and by combinations thereof.
 - 1. Moisture cure by one or more of the following methods:
 - a. Keeping concrete surface continuously wet by covering with water.
 - b. Continuous water fog spray.
 - c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.
 - 2. Moisture cover cure by covering concrete surfaces with moisture-retaining power cover for curing concrete, placed in widest practicable width with sides and ends

- lapped at least 3", and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Liquid membrane cure by applying specified curing/sealing compound or curing/hardener compound to exposed interior slabs and to exterior slabs, walks, and curbs as soon as final finishing operations are complete (within two (2) hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within three (3) hours after initial application. Maintain continuity of coating and repair damage during curing period.
 4. Do not use membrane curing compounds on surfaces to be covered with coating material applied directly to concrete; liquid floor hardener, waterproofing, dampproofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to Architect.
 5. Floors in areas receiving quarry tile, ceramic tile and liquid floor hardener shall be wet cured by use of moisture-retaining cover. Under no circumstances shall chemical hardeners or curing agents be applied to the concrete. The concrete floors shall cure a minimum of seven (7) days prior to application of the surface material. Keep the concrete floor free of all dirt, debris, paint, oil, and/or other matter, which might prevent adhesion of the surface material. Protect during the entire curing period and until final surface material has been applied and cured.
 6. Water used for moist curing shall not be more than 20 degrees F cooler than the concrete.
 7. Curing concrete by covering with plastic sheets is not permitted.
- C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor toppings, and other flat surfaces by application of appropriate curing compound. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in place construction. Provide other miscellaneous concrete shown or required to complete work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and 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. Set anchor bolts for machines and equipment at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and finish concrete surfaces as scheduled.
- E. Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

3.13 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms when acceptable to Architect. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete, but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
 - 1. For exposed to view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match the color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- B. Repair of Formed Surfaces: Remove and replace concrete defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
 - 1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- C. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.
 - 1. Repair finished unformed surfaces that contain defects, which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
 - 2. Correct high areas in unformed surfaces by grinding, after concrete has cured at least fourteen (14) days. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.

3. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and exposed reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compounds. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
4. Repair isolated random cracks and holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing #16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched areas continuously moist for not less than seventy-two (72) hours.
5. Use epoxy-based mortar for structural repairs, where directed by Architect.
6. Repair methods not specified above may be used, subject to acceptance of Architect/Structural Engineer.
7. Leveling of floors for subsequent finishes shall be achieved by use of specified underlayment material.

END OF SECTION

SECTION 03 35 43 - POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Sealing of selected concrete floor surfaces.
- B. Mechanically polishing concrete floors using a wet/dry process.
- C. Accessories required to complete polishing process.

1.2 REFERENCES

- A. ASTM International
 - 1. ASTM E430: Standard Test Methods for Measurement of Gloss of High Gloss Surfaces by Abridged Goniophotometry.
 - 2. ASTM F710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 - 3. ASTM F1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - 4. ASTM F2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- B. American National Standards Institute (ANSI)
 - 1. ANSI/NFSI B101.1: Test Method for Measuring Wet SCOF of Common Hard Surface Floor Materials.
- C. Concrete Polishing Association of America (CPAA)
- D. National Floor Safety Institute (NFSI)

1.3 SUBMITTALS

- A. Product Data: Manufacturer's technical literature for each product indicated. Include manufacturer's technical data, application instructions, and recommendations.
- B. Submit Installer Qualifications: Submit company name, principal personnel, experience, and training.
- C. Submit Field Test Reports.
- D. Maintenance Data:
 - 1. Include manufacturer's instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
 - 2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.

1.4 QUALITY ASSURANCE

- A. Refer to Section 09 90 00 - Painting and Coating for Sealer to be used on Back of House spaces indicated to have sealed concrete finish. Polished Concrete Finishing is for Public - Front of House spaces as indicated by Architect.
- B. Polisher Qualifications:
 - 1. Experience: Company experienced 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 specified work.
 - 2. Supervision: Supervisor shall be certified as Craftsman or Master Craftsman by CPAA. Supervisor shall be present at project site during polishing process.
 - 3. Manufacturer Qualification: Approved by manufacturer to apply liquid applied products.
- C. Walkway Auditor: Certified by NFSI to test polished floors for static coefficient of friction according to ANSI/NFSI B101.1.
- D. Static Coefficient of Friction: Achieve not less than 0.5 for level floor surfaces as determined by quality control testing according to ANSI/NFSI B101.1.
- E. Field Mock-up for Aesthetic Purposes: Before performing work of this Section, provide field mock-up to demonstrate aesthetic effects of polishing. Mock-up to be located in a portion of the facility that will not be public after Substantial Completion (ie closet). Confirm recommended location of Mock-up with Architect prior to performing mock-up.
 - 1. Grind, hone, and polish 20 square foot mock-up for each color and finish indicated; include edges and joints.
 - 2. Use same personnel, including supervisors, which will perform work.
 - 3. Install products and materials according to specified requirements.
 - 4. Approval is for following aesthetic qualities:
 - a. Compliance with approved submittals.
 - b. Uniformity of sheen.
 - 5. Protect approved field mock-ups from elements with weather resistant covering.
 - 6. Maintain field mock-ups during construction in an undisturbed condition as a standard for judging completed work.
 - 7. Do not demolish, alter, or remove field mock-ups until acceptable to Owner and Architect.
- F. Pre-Installation of Conference: Prior to placing concrete for areas scheduled for polishing, conduct conference at project site.
 - 1. Required Attendees:
 - a. Owner.
 - b. Architect.
 - c. Contractor, including supervisor.
 - d. Concrete producer.

- e. Concrete finisher, including supervisor.
 - f. Concrete polisher, including supervisor.
 - g. Technical representative of liquid applied product manufacturers.
 - h. Walkway auditor.
2. Minimum Agenda: Polisher shall demonstrate understanding of work required by reviewing and discussing procedures for, but not limited to, following:
- a. Tour mock-up and representative areas of required work, discuss and evaluate for compliance with Contract Documents, including substrate conditions, surface preparations, sequence of procedures, and other preparatory work performed by other installers.
 - b. Review Contract Document requirements.
 - c. Review approved submittals.
 - d. Review procedures, including, but not limited to:
 - 1) Details of each step of grinding, honing, and polishing operations.
 - 2) Application of liquid applied products.
 - 3) Protecting concrete floor surfaces until polishing work begins.
 - 4) Protecting polished concrete floors after polishing work is completed.

1.5 FIELD CONDITIONS

- A. Damage and Stain Prevention: Take precautions to prevent damage and staining of concrete surfaces to be polished.
- 1. Prohibit vehicle parking over concrete surfaces to be polished.
 - 2. Prohibit pipe cutting operations over concrete surfaces to be polished.
 - 3. Prohibit storage of any items over concrete surfaces to be polished for not less than 28 days after concrete placement.
 - 4. Prohibit ferrous metals storage over concrete surfaces to be polished.
 - 5. Protect from petroleum, oil, hydraulic fluid, or other liquid dripping from equipment working over concrete surfaces to be polished.
 - 6. Protect from acids and acidic detergents contacting concrete surfaces to be polished.
 - 7. Protect from painting activities over concrete surfaces to be polished.
- B. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting liquid applied product application.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: Selectseal-W sealer by L.M. Scofield Company 800-800-9900 www.scofield.com.

2.2 LIQUID APPLIED PRODUCTS

- A. Liquid Densifier: Odorless, non-hazardous, silicate that penetrates concrete to react with free lime and calcium hydroxide to produce permanent chemical reaction that hardens and densifies concrete surface.
- B. Sealer: One-part, water based aliphatic polyurethane sealer.
- C. Polish Guard: Non-film forming, stain resistant, food resistant, chemical stain resistant, impregnating sealant designed to be used on concrete surfaces previously densified.

2.3 ACCESSORIES

- A. Patching Compound: 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.
- B. Grout Material: 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.
- C. Protective Cover: Non-woven, puncture and tear resistant, polypropylene fibers laminated with a multi-ply, textured membrane, not less than 18 mils in thickness.

2.4 POLISHING EQUIPMENT

- A. Field Grinding and Polishing Equipment:
 - 1. Variable speed, multiple head, counter-rotating, walk-behind machine with not less than 600 pounds of down pressure on grinding or diamond polishing pads.
 - 2. If dry grinding, honing, or polishing, use dust extraction equipment with flow rate suitable for dust generated, with squeegee attachments.
- B. Burnishing Equipment: High speed walk-behind or ride-on machines capable of generating 1000 to 2000 revolutions per minute and with sufficient head pressure of not less than 20 pounds to raise floor temperature by 20 degrees F.
- C. Metal Bonded Pads: Grinding pads with embedded industrial grade diamonds of varying grits fabricated for mounting on equipment.
- D. Resin Bonded Pads: Polishing pads with embedded industrial grade diamonds of varying grits fabricated for mounting on equipment.
- E. Burnishing Pads: Maintenance pads for use with high speed burnishing equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to be polished for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting work within a particular area will be construed as acceptance of surface conditions.

B. Field Testing:

1. Alkalinity:
 - a. Test Method: Measure pH according to method indicated in ASTM F710.
 - b. Acceptable Results: pH between 8 and 10.
2. Moisture Vapor Transmission Rate:
 - a. Test Method: Perform anhydrous calcium chloride test according to ASTM F1869.
 - b. Acceptable Results: Not more than 5 pounds per 1000 square feet in 24 hours.
3. Relative Humidity:
 - a. Test Method: Perform relative humidity test using in situ probes according to ASTM F2170.
 - b. Acceptable Results: Not more than 75 percent.
 - c. Examine substrates to be polished for compliance with requirements and other conditions affecting performance.

3.2 PREPARATION

A. Cleaning New Concrete Surfaces:

1. Prepare and clean concrete surfaces.
2. 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 liquid applied products and polishing.

3.3 POLISHING CONCRETE FLOORS

A. Initial Grinding:

1. Use grinding equipment with metal bonded grinding pads.
2. Begin grinding in one direction using sufficient size grit pad.
3. Make sequential passes with each pass perpendicular to previous pass using finer grit pad with each pass, up to 150 grit.

4. Achieve maximum refinement with each pass before proceeding to finer grit pads.
 5. Vacuum floor using squeegee vacuum attachment after each pass.
 6. Continue grinding until aggregate exposure matches approved field mock-ups.
- B. 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 reasonably noticeable when viewed from 10 feet away under lighting conditions that will be present after construction.
- C. Liquid Densifier Application: Apply undiluted to point of rejection, remove excess liquid, and allow to cure according to manufacturers instructions.
- D. Grout Grinding:
1. Use grinding equipment and appropriate grit grinding pads.
 2. While applying fresh grout material prior to, grind concrete in direction perpendicular to initial grinding to remove scratches.
 3. Vacuum floor using squeegee vacuum attachment after each pass.
- E. Honing:
1. Use grinding equipment with resin bonded grinding pads.
 2. Grind concrete in one direction starting with 50 grit pad and make as many sequential passes required to remove scratches, each pass perpendicular to previous pass, up to 400 grit pad reaching maximum refinement with each pass before proceeding to finer grit pads.
 3. Auto scrub or vacuum floor using squeegee vacuum attachment after each pass.
- F. Polishing:
1. Use polishing equipment with resin bonded polishing and burnishing pads.
 2. Begin polishing in one direction starting with 800 grit pad.
 3. Make sequential passes with each pass perpendicular to previous pass using finer grit pad with each pass, up to 3000 grit.
 4. Achieve maximum refinement with each pass before proceeding to finer grit pads.
 5. Auto scrub or vacuum floor using squeegee vacuum attachment after each pass.
 6. Continue polishing until gloss appearance, as measured according to ASTM E430, matches approved field mock-ups.
- G. Polish Guard: Apply and remove excessive liquid according to manufacturer's instructions.
- H. Final Polish: Using burnishing equipment and finest grit burnishing pads, burnish to uniform sheen matching approved mock-up.

3.4 FIELD QUALITY CONTROL

- A. Field Testing: Engage a qualified walkway auditor to perform field testing according to ANSI/NFSI B101.1 to determine if polished concrete floor finish complies with specified static coefficient of friction.

3.5 CLOSEOUT ACTIVITIES

- A. Maintenance Training: CPAA Master Craftsman shall train Owner's designated personnel in proper procedures for maintaining polished concrete floor.

3.6 PROTECTION

- A. Covering: After completion of polishing, protect polished floors from subsequent construction activities with protective covering.

END OF SECTION

SECTION 03 45 00 - INSULATED CONCRETE PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Precast insulated concrete wall panel units, including manufacture, transportation, handling, erection and other related items such as anchorage, bearing pads, storage and protection of units.

1.2 DEFINITION

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

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide insulated concrete panels units and connections capable of withstanding the following design loads within limits and under conditions indicated:
 - 1. Wind and Seismic: As indicated on the Structural Drawings.
 - 2. Maximum Horizontal Deflection: $H/360$, not to exceed $\frac{1}{2}$ ".
- B. Warranty: Manufacturer shall warrant that the insulated concrete wall panel units will not spall or show visible cracking beyond accepted industry standards, splitting, deformation, or loosening resulting from inferior materials or workmanship by this trade for a period of one (1) year effective from the date of the substantial completion of the precast erection. Precast units showing such defects will be repaired or replaced at the precaster's option and made acceptable to the Owner or his representatives at no expense to the Owner.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated include technical data and tested physical and performance properties.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.
- D. Shop Drawings:

1. Erection Drawings:
 - a. Member piece marks and completely dimensioned size and shape of each member.
 - b. Plans and/or elevations locating and defining all products furnished.
 - c. Sections and details showing connections, cast-in items and their relation to the supporting structures.
 - 1) Details, dimensional tolerances and related information of other trades affecting precast concrete work should be furnished to the precast concrete manufacturer.
 - d. Joints and openings between members and between members and structure.
 - e. Description of all loose, cast-in and field hardware.
 - f. Field installed anchor location drawings.
2. Production Drawings:
 - a. Elevation view of each member.
 - b. Sections and details to indicated quantities, size, and position of reinforcing steel, anchors, inserts, etc.
 - c. Handling devices.
 - d. Dimensions and finishes.
 - e. Tension for strand.
 - f. Concrete strengths.
 - g. Dunnage points for storage and transportation.
3. Product design criteria:
 - a. Loadings for design:
 - 1) Handling stress limits.
 - 2) All dead, live loads, seismic and wind loads as specified on the contract drawings.
 - 3) All other loads specified for members, where applicable.
 - b. As directed on the contract drawings, design calculations of products shall be performed, sealed and submitted for approval by an engineer registered in the state where the project is located, who is experienced in precast, prestressed insulated concrete design.
 - c. Design shall be in accordance with applicable codes as specified in the contract documents.

E. Engineering Data:

1. Submit complete design calculations for all precast members and connections. Indicate all design loads, including live loads, wind loads, seismic loads, and dead loads and including all handling stresses during shipment and erection and due to loads from construction procedures. Design calculations shall be performed, sealed and submitted by Precast Concrete Contractor's Professional Engineer, licensed to practice in the State of North Carolina, who is experienced in precast, prestressed

insulated concrete design. Design calculations shall be based on requirements of Performance Requirements and product design criteria specified herein.

- F. Detail fabrication and installation of precast insulated concrete units. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit. Indicate joints, reveals, and extent and location of each surface finish. Indicate details at building corners.
 - 1. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from precast insulated concrete.
- G. Samples:
 - 1. For each type of finish indicated on exposed surfaces of insulated concrete units, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.
 - 2. Prior to product fabrication of precast concrete panel units, prepare an on-site mock up, as indicated in the drawings, for final approval of the color and finish; arrange for architect's timely review of mock up at precaster's plant.
 - a. Notify architect when sample is ready for review at precaster's plant, and advise of schedule impact if review is not made in a timely way.
 - b. Do not start production fabrication of precast concrete panels with architectural finishes until sample units have received architect's written approval.
 - c. The approved mock-up panels shall be a standard of quality for the color and range of required finishes.

1.5 INFORMATIONAL SUBMITTALS

- A. Current welder certificates for welding of reinforcements, shop and field connections.
- B. Current plant PCI certification.
- C. Material Certificates: Signed by manufacturers:
- D. Material test reports: For aggregates.
- E. Field quality-control test and special inspection reports.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast insulated concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. The precast concrete manufacturer shall have 5 years of proven experience in the design and manufacture of precast concrete wall panels.
 2. The precast concrete manufacturing plant shall belong to an AltusGroup, Inc. precaster licensed to design and manufacture lightweight CarbonCast precast concrete wall panels with C-GRID epoxy-coated carbon-fiber open strand mesh at the plant location.
 3. Participates in PCI's plant certification program and is designated a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units.
- B. Design Standards: Comply with ASCE 7, ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete."
- C. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
- D. Quality-Control Standards for structural wall panels:
1. For panels with a form finished gray concrete or stained or painted faces: Comply with PCI MNL 116 through C-3 (minimum), "Manual for Quality Control; Precast and Prestressed Concrete."
 2. For panels with an architectural precast finish: Comply with PCI MNL 116 C-3A, "Manual for Quality Control; Precast and Prestressed Concrete."
- E. Welding: Qualify procedures and personnel according to AWS D1.1/D.1.1M, "Structural Welding Code - Steel"; and AWS D1.4, "Structural Welding Code - Reinforcing Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and handling:
1. Precast concrete members shall be handled only at the lifting or supporting points, as shown on the shop drawings, and with suitable lifting devices. Lifting inserts shall have a minimum safety factor of 4. Rigging shall have a minimum safety factor of 5.
 2. Transportation, site handling and erection shall be performed by the precaster, or its agents, with equipment and methods employed by qualified personnel acceptable to the precaster.
- B. Storage:
1. Store all units off ground and clear of other staining influences.
 2. Place stored units so that identification marks are discernible.
 3. Separate stacked members by battens across full width of each bearing point. Protect all edges.
 4. Protect all holes and reglets against water and ice in freezing weather.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Provide CarbonCast precast concrete insulating wall panels as manufactured by an AltusGroup, Inc. member precast concrete manufacturer.
- B. Basis of Design Description:
 - 1. Finish:
 - a. Exposed Conditions: Medium Acid Etched on all exposed surfaces
 - b. Non-Exposed Exterior and Interior Conditions: Steel troweled finish. Finish shall not interfere with the application of other finishes including signage or paint.
 - 2. Cement: White
 - 3. Fine Aggregate: Light Brown sand
 - 4. Coarse Aggregate: Grey Granite
 - 5. Pigment: Charcoal

2.2 CONCRETE MATERIALS

- 1. Portland Cement: ASTM C 150, Type I or Type III.
- 2. Other cementitious materials:
 - a. Fly ash or natural pozzolans: ASTM C618.
 - b. Ground granulated blast furnace slag: ASTM C989.
 - c. Silica fume: ASTM C1240.
- 3. Normal-Weight Aggregates for face and back wythes: Except as modified by PCI MNL 116 or ASTM C 33.
- 4. Light-Weight Aggregates for back wythes (optional – use if needed to increase panel R-value or reduce superstructure or transportation cost): Except as modified by PCI MNL 116 or ASTM C 33 with absorption less than 11 percent.
 - a. If using light-weight back wythe aggregates, use similar water-cement and cement-aggregate ratios for both wythes to limit bowing or warping.
- 5. Admixtures:
 - a. Air-entraining admixtures: ASTM C260.
 - b. Water reducing, retarding, accelerating, high range water reducing admixtures: ASTM C494 or C1017.
 - c. Viscosity-Modifying Admixture.
 - d. Coloring Admixture: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, non-fading, and alkali resistant.

- e. Metakaolin Admixture: ASTM C 618, Class N.
 - f. Calcium chloride or admixtures containing chlorides shall not be used.
6. Water: Potable.

2.3 REINFORCING MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
- B. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.
- D. Galvanized reinforcing bars: ASTM A767.
- E. Epoxy-coated reinforcing bars: ASTM A775.
- F. Plain-Steel Wire: ASTM A82, as drawn.
- G. Deformed-Steel Wire: ASTM A 496.
- H. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- I. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- J. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to PCI MNL 116 section specified in 1.6.D (QUALITY ASSURANCE).
- K. Prestressing Strand: ASTM A 416, Grade 250 or 270, uncoated, 7-wire, low-relaxation strand.

2.4 C-GRID EPOXY COATED INTERLAID CARBON FIBER MESH

- A. Product construction and architecture supplied in accordance with minimum MARV tensile strength tow values (reported in pounds force per single end) and approved for CarbonCast product use by the AltusGroup Technical Committee.
- B. Yarn Type: Industrial Grade PAN based carbon fiber with suitable epoxy sizing as approved by the manufacturer (24K - 50K carbon fiber tows).
- C. Binder Chemistry: Chomarat Formulation: Epoxy D1156 (standard Tg) and/or Epoxy D2047 (High Tg).
- D. Yarn/Strand Direction: Warp and Weft Strands to be laid perpendicular to each other; warp yarns to be superimposed.
- E. Cross over bond: Fully bonded to ensure proper tow integrity.

- F. Strands: No missing, broken, or degraded strands.

2.5 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A 36.
- B. Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1, Type A or B, with arc shields.
- C. High-Strength, Low-Alloy Structural Steel: ASTM A 572.
- D. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.
- E. Stainless steel: ASTM A666, Type 304.
- F. Threaded Rods: ASTM A36, A193 or A307
- G. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706.
- H. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563; and flat, unhardened steel washers, ASTM F 844.
- I. High-Strength Bolts and Nuts: ASTM A 325, Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563; and hardened carbon-steel washers, ASTM F 436 .
- J. 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 after fabrication, and ASTM A 153 or equivalent as applicable.
 - 1. 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-21035A or SSPC-Paint 20.
- K. Shop-Primed Finish: Prepare surfaces of non-galvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead-and chromate-free, rust-inhibiting primer, complying with performance requirements in FS TT-P-664 according to SSPC-PA 1.

2.6 GROUT MATERIALS

- A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 3 parts sand, by volume, with minimum water required for placement and hydration.
- B. Nonmetallic, nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.

- C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of FS MMM-A-001993.

2.7 BEARING PADS

- A. Chloroprene (Neoprene): Conform to Div II, Section 18 of AASHTO Standard Specifications for Highway bridges.
- B. Random Oriented Fiber Reinforced: Shall support a compressive stress of 3,000 psi with no cracking, splitting or delaminating in the internal portions of the pad.
- C. Plastic: Multi-monomer plastic strips shall be non-leaching and support construction loads with no visible overall expansion.

2.8 INSULATION

- A. Extruded Polystyrene (XPS) Board Insulation: Rigid, closed cell, expanded polystyrene, ASTM C 578, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, Type IV, 1.50-1.60 lb/cu. ft., unfaced, minimum R= 13.
- B. Polyethelene Foam Insulation: Ethafoam.
- C. Mineral Wool Firestopping Insulation: ASTM C 136 for combustibility; ASTM E 84 for surface burning characteristics, flame spread 25 or less, smoke developed 450 or less (50 or less in plenum); install in accordance with the assembly listing by a nationally recognized testing laboratory.

2.9 CAST-IN ITEMS

- A. All grouted connection tubes and lifting device covers shall use the appropriate blow molded plastic accessory to produce a uniform void suitable to receive grouting or, where appropriate, to eliminate field patching of lifting devices.
- B. To the greatest extent possible lifting points are to be on concealed faces of panels.

2.10 CONCRETE MIXES

- A. Self Compacting Concrete (SCC): Proportion mixes by laboratory trial batch or field test data methods in accordance with generally accepted practice to provide SCC with the appropriate balance of filling ability, passing ability and segregation resistance characteristics to produce materials meeting the following minimum properties:
 - 1. Compressive Strength (28 Days): 5000 psi
 - 2. Compressive strength at time of release for pre-tensioned members: 3500 psi.
 - 3. Compressive strength at stripping for precast members: 2000 psi.

- B. Normal-Weight Concrete Face and Back Wythe Mixes: Proportion mixes 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.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.40.
- C. Light-Weight Concrete Back Wythe Mixes (optional): Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide light-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 5000 psi.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.40.
- D. Water Absorption: 12 to 14 percent by volume, tested according to PCI MNL 116.
- E. 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.

2.11 FABRICATION

- A. Fabrication procedures shall be in general compliance with the PCI MNL-116 section specified in 1.6.D (QUALITY ASSURANCE). There shall be no piece markings, or any other marking visible after installation due to interior and exterior exposed conditions.
- B. Formwork: Comply with ACI 347. Prefabricated mold shall be one-piece seamless rigid molds for exposed faces. Prevent deformation of molds and maintain mold surfaces free of irregularities, dents, sags, or damage of any kind.
- C. Anchorage Hardware: Fabricate with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations.
- D. Embedded items shall be installed in panels, plumb and square.
- E. Furnish loose steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing insulated concrete units to supporting and adjacent construction.
- F. Cast-in reglets, slots, holes, and other accessories in insulated concrete units to receive windows, cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.
- G. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" and the PCI MNL 116 section specified in 1.6.D (QUALITY ASSURANCE) for fabricating, placing, and supporting reinforcement.
- H. Reinforce precast concrete wall units to resist handling, transportation, and erection stresses.
- I. Pre-stress tendons for precast concrete wall units by either post-tensioning or pre-tensioning method. Comply with PCI MNL 116.

- J. Mix concrete according to the PCI MNL 116 section specified in 1.6.D (QUALITY ASSURANCE) and requirements in this Section. After concrete batching, no additional water may be added.
- K. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in the PCI MNL 116 section specified in 1.6.D (QUALITY ASSURANCE) for measuring, mixing, transporting, and placing concrete.
 - 1. The production of SCC shall be carried out in plants in which the equipment, operation and materials are suitably controlled.
 - 2. All production staff involved in the production of SCC shall have been trained and possess experience in SCC.
- L. Identify pickup points of insulated concrete wall units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each insulated concrete wall unit on a surface that will not show in finished structure. To the extent possible, do not place pickpoints on exterior face of panels.
- M. Openings:
 - 1. Manufacturer shall provide for openings 10 inch round or square or larger as shown on the contract drawings.
 - 2. Other openings shall be located and field drilled or cut by the trade after erection. Openings shall be approved by both architect and precaster before drilling or cutting.
- N. Cure concrete, according to requirements in PCI MNL 116, by accelerated heat curing using low-pressure live steam or radiant heat.
 - 1. SCC can set faster than conventional concrete. Initial curing shall commence as soon as practicable after placement to minimize the risk of shrinkage cracking.
- O. Fabricate insulated concrete wall panels straight and true to size and shape, with exposed edges and corners precise and true so each finished panel complies with PCI MNL 116 product tolerances as well as position tolerances for cast-in items.
- P. Patching: Shall be acceptable providing the structural adequacy of the product and the appearance are not impaired.
- Q. Damaged, chipped or discolored units shall be replaced, patched or refinished as directed by the Architect and/or Engineer, and to their approval.

2.12 FABRICATION TOLERANCES

- A. Fabricate insulated concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

2.13 SOURCE QUALITY CONTROL

- A. Quality Control Testing: Test and inspect insulated concrete according to the PCI MNL 116 section specified in 1.6.D (QUALITY ASSURANCE) requirements.
- B. Owner will employ an independent testing agency and Special Inspector to evaluate insulated concrete fabricator's quality-control and testing methods.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Site access: General contractor shall be responsible for providing suitable access to the building, proper drainage and firm, level bearing for the hauling and erection equipment to operate under their own power.
- B. Preparation of structures to receive insulated panels: General contractor shall be responsible for:
 - 1. Providing true, level bearing surfaces on all field placed bearing surfaces.
 - 2. Placement and accurate alignment of anchor bolts, plates or dowels in column footings, grade beams and other field placed supporting members.
- C. Install insulated concrete panels.
 - 1. Erection shall be carried out by erectors meeting requirements of this Section.
 - 2. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.
 - 3. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
- D. Anchor insulated concrete units in position by bolting, welding, grouting, or as otherwise indicated.
- E. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.
 - 1. Repair damaged steel surfaces by cleaning and applying a coat of galvanized repair paint to galvanized surfaces or by re-priming damaged painted surfaces.
- F. Install insulated concrete wall units level, plumb, square, true, and in alignment without exceeding the non-cumulative erection tolerances of PCI MNL 125 or 127.

- G. Repair exposed exterior surfaces of insulated concrete wall units to reasonably match color, texture, and uniformity of approved mock up panel(s) and surrounding insulated concrete when repair is permitted by Architect and/or Engineer.
- H. Subject to approval of the Architect and precast Engineer, precast concrete wall panels may be drilled or “shot” by other trades for attachment of other building components provided no contact is made with prestressing steel. Should spalling occur, repair of the spall shall be the responsibility of the trade doing the drilling or the shooting.
- I. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains caused by the erector. If other trades cause damage, marks, dirt, or stains they shall be liable for the costs of cleaning or repair.
- J. Inspection and Acceptance: Final inspection and acceptance of erected insulated concrete units shall be made by the Architect and/or Engineer within a reasonable time after the insulated units are installed and final alignment of the units is completed.

3.3 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections and prepare reports.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
- C. Field welds will be subject to visual inspections and nondestructive testing according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be 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, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 REPAIRS

- A. Repair damaged insulated concrete units if permitted by Architect. The Architect reserves the right to reject repaired units that do not comply with requirements.
- 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.
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

- D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- E. Remove and replace damaged insulated concrete units when repairs do not comply with requirements.

3.5 CLEANING

- A. Clean surfaces of insulated concrete units exposed to view.
- B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
- C. Clean exposed surfaces of insulated 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 insulated concrete fabricator's recommendations. Clean soiled insulated concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. 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

SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Concrete masonry units (CMU).
- B. Decorative concrete masonry units.(Decorative CMU)

1.2 SUBMITTALS

- A. Shop Drawings:
 - 1. For 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.
 - 2. For decorative CMU: Show fabrication and installation details for decorative concrete masonry units. Include dimensions, details of reinforcement and anchorages, details showing flashing and terminations at intersections with other building materials, and indication of finished faces. Show surrounding conditions, special shop finished conditions, layouts and sizes.
- B. Decorative CMU Coordination Drawings: Interior and exterior elevations, drawn to scale showing all penetrations and wall mounted items, control joints and bond patterns.
- C. Samples
 - 1. For each type and color of decorative CMU required
 - 2. For color mortar masonry units and colored mortars.
 - 3. For each required condition of shop finishing at edges of Decorative CMU - submit a shop finished sample and standard sample for review.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1.3 QUALITY ASSURANCE

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made from the Testing and Inspecting Allowance, as authorized by Change Orders.
 - 1. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.
 - 2. Mortar Test (Property Specification): For each mix required, per ASTM C 780
 - 3. Grout Test (Compressive Strength): For each mix required, per ASTM C 1019
- B. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and

inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

- C. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects.
 - 1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches long by 48 inches high.

1.4 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. 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.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS (CMUs)

- A. Standard Concrete Masonry Units: ASTM C 90.
 - 1. Manufacturers
 - a. Basis of Design: Products by Johnson Concrete Company.
 - b. Oldcastle
 - 2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi .
 - 3. Weight Classification: Normal weight.
 - 4. Pattern and Texture for Decorative Units:
 - a. Standard pattern, ground finish.
- B. Decorative Concrete Masonry Units: ASTM C 90.
 - 1. Basis of Design: E Dillon & Company, no substitutions
 - 2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi .
 - 3. Weight Classification: Normal weight.
 - 4. Color: Dominion
 - 5. Size: As indicated on Drawings
 - 6. Custom Shapes: Custom angled cuts finished to match exposed face
 - 7. Pattern and Texture for Decorative Units:
 - a. Finish 1: Splitface
 - b. Finish 2: Matte

c. Finish 3: Reflective Series

- C. Shapes: Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 1. Provide CMU bullnose corners at exterior corners on interior of building, at locations designated by Architect. None required at decorative CMU
- D. Integral Water Repellent for exterior units.: Provide units made with liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength for exposed units.
 - 1. Products
 - a. Addiment Incorporated; Block Plus W-10.
 - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
 - c. Master Builders, Inc.; Rheopel

2.2 MASONRY LINTELS

- A. Masonry Lintels: Made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout.

2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Masonry Cement: ASTM C 91.
 - 1. Products:
 - a. Capital Materials Corporation; Flamingo Color Masonry Cement.
 - b. Holcim (US) Inc.; White Mortamix Masonry Cement.
 - c. Lafarge North America Inc.; Trinity Super White Masonry Type S.
- D. Mortar Pigments: Iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
 - 1. Products:
 - a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
 - b. Davis Colors; True Tone Mortar Colors.
 - c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.
- E. Aggregate for Mortar: ASTM C 144.
 - 1. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- F. Mortar Color
1. CMU: As selected from standard colors
 2. Decorative CMU: Refer to Mock-up Panel Drawings for Mortar Colors.
- G. Aggregate for Grout: ASTM C 404.
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Products:
 - a. Addiment Incorporated; Mortar Kick.
 - b. Euclid Chemical Company (The); Accelguard 80.
 - c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
 - d. Sonneborn, Div. of ChemRex; Trimix-NCA.
- I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
1. Products:
 - a. Addiment Incorporated; Mortar Tite.
 - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
 - c. Master Builders, Inc.; Rheomix Rheopel.
- J. Water: Potable.

2.4 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Masonry Joint Reinforcement: ASTM A 951; mill galvanized, carbon-steel wire for interior walls and hot-dip galvanized, carbon-steel wire for exterior walls.
1. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
 2. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
 3. Wire Size for Veneer Ties: W1.7 or 0.148-inch diameter.
 4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 5. Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
 6. Multiwythe Masonry:
 - a. Adjustable (two-piece) type, with one side rod at each face shell of backing wythe and with ties that extend into facing wythe. Ties engage eyes or slots in reinforcement and extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
 7. Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.188-inch- diameter, hot-dip galvanized, carbon-steel continuous wire.

2.5 TIES AND ANCHORS

A. Materials:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
2. 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.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Wire: Fabricate from 3/16-inch-diameter, hot-dip galvanized steel wire.

D. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch- diameter, hot-dip galvanized steel wire.
3. Connector Section for Concrete: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.097-inch-thick, steel sheet, galvanized after fabrication.

E. Partition Top anchors: 0.097-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

F. Adjustable Masonry-Veneer Anchors

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
 - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
 - a. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, and slotted holes for inserting wire tie.
 - b. Fabricate sheet metal anchor sections from 0.097-inch-thick, steel sheet, galvanized after fabrication.
 - c. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.25-inch-diameter, hot-dip galvanized steel wire.
 - d. Products:

- 1) Heckmann Building Products Inc.; 315-D with 316.
- 2) Hohmann & Barnard, Inc.; DW-10HS or DW-10-X.
- 3) Wire-Bond; 1004, Type III or RJ-711.

2.6 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with Division 07 Section "Sheet Metal Flashing and Trim."
1. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/4 inch out from wall, with outer edge bent down 30 degrees.
 2. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 3/8 inch to form a stop for retaining sealant backer rod.
- B. Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:
1. At unsupported locations: Copper-Laminated Flashing: 5-oz./sq. ft. copper sheet bonded with asphalt between 2 layers of glass-fiber cloth.
 - a. Products:
 - 1) Advanced Building Products Inc.; Copper Fabric Flashing.
 - 2) AFCO Products Inc.; Copper Fabric.
 - 3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
 - 4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
 - 5) Polytite Manufacturing Corp.; Copper Fabric Flashing.
 - 6) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
 - 7) York Manufacturing, Inc.; York Copper Fabric Flashing.
 2. At supported locations: Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.
 - a. Products:
 - 1) Advanced Building Products Inc.; Peel-N-Seal.
 - 2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - 3) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
 - 4) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
 - 5) Hohmann & Barnard, Inc.; Textroflash.
 - 6) Polyguard Products, Inc.; Polyguard 300.
- C. Solder and Sealants for Sheet Metal Flashings: As specified in Section 07 62 00 - Sheet Metal Flashing and Trim.

- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep/Vent Products: Use the following, unless otherwise indicated:
 - 1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, maximum height of 4 inches and full width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard. Multiple colors of weep will be required to match adjacent materials.
 - a. Products:
 - 1) Advanced Building Products Inc.; Mortar Maze weep vent.
 - 2) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
 - 3) Heckmann Building Products Inc.; No. 85 Cell Vent.
 - 4) Hohmann & Barnard, Inc.; Quadro-Vent.
 - 5) Wire-Bond; Cell Vent.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 - 1. Provide one of the following configurations:
 - a. Strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep.
 - 2. Products:
 - a. Advanced Building Products Inc.; Mortar Break.
 - b. Archovations, Inc.; CavClear Masonry Mat.
 - c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
 - d. Mortar Net USA, Ltd.; Mortar Net.

2.8 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains from new masonry without damaging masonry. Use product approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.9 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, unless otherwise indicated.
 1. Do not use calcium chloride in mortar or grout.
 2. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement and lime.
 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. Mortar for Unit Masonry: Comply with ASTM C 270 , Property Specification.
 1. For masonry below grade or in contact with earth, use Type S.
 2. For reinforced masonry, use Type N.
 3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
 4. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- C. Pigmented Mortar: Use colored cement product
 1. Pigments shall not exceed 10 percent of portland cement by weight.
 2. Pigments shall not exceed 5 percent of masonry cement by weight.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.
- E. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required, 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.

- B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
- C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.
- D. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
 - 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

3.2 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Decorative Unit Masonry: Lay decorative masonry in running bond, do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs, and maintain uniform aesthetic of decorative face.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
- F. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.3 MORTAR BEDDING AND JOINTING

- A. Lay hollow 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 to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.4 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
 - 1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
 - 2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
 - 3. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- 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. Cove cavity face of backup wythe to comply with Section 07 13 26 - Self-Adhering Sheet Waterproofing, 07 25 00 Weather Barriers and 07 27 26 - Fluid-Applied Membrane Air Barriers.
- D. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit insulation between wall ties and other confining obstructions, with edges butted tightly. Press units firmly against inside wythe of masonry.

3.5 MASONRY JOINT REINFORCEMENT

- A. General: Install in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
- B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.

- D. Provide continuity at corners by using prefabricated L-shaped units.

3.6 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten screw-attached anchors to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners.
 - 2. Embed connector sections and continuous wire in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
 - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.7 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. 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 as recommended by flashing manufacturer.
 - 2. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 - 3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
 - 4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
- C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
 - 1. Use specified weep/vent products to form weep holes.
 - 2. Space weep holes 24 inches o.c., unless otherwise indicated.
- D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.
- E. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.8 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 as indicated on S1.01.

3.9 FIELD QUALITY CONTROL

- A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
 1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
- B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:
 1. Payment for these services will be made from Testing and Inspecting Allowance, as authorized by Change Orders.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.
- E. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for mortar air content and compressive strength.
- F. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

3.10 CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 - 2. Protect adjacent surfaces from contact with cleaner.
 - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 4. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.11 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.
 - 2. 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

SECTION 04 72 00 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Cast stone wall veneer.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include dimensions and finishes.
- B. LEED Submittals:
 - 1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
- C. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, details showing flashing and terminations at intersections with other building materials, and indication of finished faces. Show surrounding conditions.
- D. Coordination Drawings: Exterior elevations, drawn to scale showing all penetrations and wall mounted items, control joints and bond patterns.
- E. Samples:
 - 1. For each color and texture of cast stone required.
 - 2. For colored mortar.
- F. Qualification Data: For manufacturer.
- G. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

1.3 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.

PART 2 - PRODUCTS**2.1 CAST STONE UNITS**

- A. Manufacturers:
 - 1. Basis of Design: RockCast Architectural Masonry Veneer by Reading Rock, Inc.
- B. Colors and Textures: Pewter GP-C
- C. Size: As indicated on Drawings.

2.2 ACCESSORIES

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

2.3 MORTAR

- A. Comply with requirements in Section 042000 "Unit Masonry" for mortar materials and mixes.
 - 1. For setting mortar, use Type S.
 - 2. For pointing mortar, use Type N
 - 3. Pigmented Mortar: Use colored cement product
 - a. Color: See Mock-up panel drawing for mortar colors

2.4 SOURCE QUALITY CONTROL

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

PART 3 - EXECUTION**3.1 SETTING CAST STONE IN MORTAR**

- A. Install cast stone units to comply with requirements in Section 04 20 00 - Unit Masonry.

- B. Set units in full bed of mortar with full head joints unless otherwise indicated.
 - 1. Fill dowel holes and anchor slots with mortar.
 - 2. Fill collar joints solid as units are set.
 - 3. Build concealed flashing into mortar joints as units are set.
 - 4. Keep head joints in coping and other units with exposed horizontal surfaces open to receive sealant.
 - 5. Keep joints at shelf angles open to receive sealant.
- C. Rake out joints for pointing with mortar to depths of not less than 3/4 inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.
- D. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch (10 mm). Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- F. Provide sealant joints at copings and other horizontal surfaces, at expansion, control, and pressure-relieving joints, and at locations indicated.
 - 1. Keep joints free of mortar and other rigid materials.
 - 2. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07 92 00 - Joint Sealants.

3.2 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

- A. Set units accurately in locations indicated with edges and faces aligned.
 - 1. Install anchors, supports, fasteners, and other attachments to secure units in place.
 - 2. Shim and adjust anchors, supports, and accessories.
- B. Fill anchor holes with sealant.
 - 1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.
- C. Set cast stone supported on clip or continuous angles on resilient setting shims. Hold shims back from face of cast stone a distance at least equal to width of joint.
- D. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast stone units are anchored.
- E. 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, 1/4 inch in 20 feet or 1/2 inch maximum.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

3.4 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 to comply with requirements in Section 04 20 00 - Unit Masonry.

END OF SECTION

SECTION 05 12 00 – STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Structural steel.
 - 2. Non-Shrink Grout.

1.2 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.3 PERFORMANCE REQUIREMENTS

- A. Design of Connections: Structural Steel Fabricator provide connection details to withstand reactions indicated on the structural drawings and in compliance with other information and restrictions indicated.
 - 1. Unless beam reactions are shown on the drawings, connections of steel beam framing shall be designed for one-half (1/2) the uniform load on the member as defined by the Maximum Total Uniform Load tables in the 13th Edition of the AISC, Manual of Steel Construction or 15 kips whichever is greater.
 - 2. Design reaction need not exceed the shear capacity of the full depth beam section, unless otherwise noted.
 - 3. Design reactions and forces shown on plans are based on AISC ASD design methods. If LRFD methods are utilized in design of connections, design forces shown shall be increased by multiplying given value by 1.6.
 - 4. Bolted connections shall be bearing type, unless noted otherwise on the drawings as slip-critical.
 - 5. Capacity of ends of members to support connection loads shall be checked where effected by copes or cuts in end of member. Check for reduced shear capacity due to web block shear and reduced bending capacity in coped section (including any reductions necessary due to instability of unstiffened web in compression). Details required to restore or reinforce members shall be provided by the fabricator.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Fabricator's Shop and Field Use Drawings: Show shop and field fabrication of structural-steel components and assemblies.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment details and setting drawings for installation of anchor bolts and other anchorages and embedments to be installed by others.

3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Contractor shall review shop drawings prior to submission to Structural Engineer. Drawings submitted shall bear Contractor's approval stamp accepting responsibility for dimensions, quantities and coordination with other trades.
5. Contractor shall allow a minimum of 10 business days for the review and return of structural steel shop drawings. Contractor shall provide in the schedule, time for review and return of shop drawings. Shop drawings rejected due to non-compliance with the structural documents shall be resubmitted with the same time requirements for review as noted above.
6. Structural Engineers review of shop drawings will be for general design consideration only. Compliance with requirements for material fabrication and erection (fit-up) of structural steel is the Contractors responsibility

C. LEED Submittal:

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

1.5 QUALITY ASSURANCE

- A. Comply with applicable provisions of the following specifications and documents, except where more stringent requirements are indicated:
1. AISC 303-05 "Code of Standard Practice for Steel Buildings and Bridges", March 18, 2005 Edition as modified herein.
 - a. Delete Paragraph 3.3. Substitute following: All things which, in the opinion of the Contractor, appear to be deficiencies, omissions, contradictions, or ambiguities in the Plans or Specifications shall be brought to attention of the Architect and Structural Engineer. Plans and Specifications will be corrected or written interpretation of alleged deficiency, omission, contradiction or ambiguity will be made by the Architect or Structural Engineer before effected work proceeds. Do not scale the drawings. Use dimensions or seek clarification.
 - b. Delete Paragraph 4.4.1: Substitute following: Indication of compliance by the Owner of the shop drawings prepared by the Fabricator indicates that the Fabricator has correctly interpreted the contract requirements. Such information does not relieve the Fabricator of responsibility for the accuracy of dimensions on the shop drawings nor the general fit-up of field assemblies.
 - c. Paragraphs 7.1 through 7.7: Delete all references to "Owner" and substitute in its place, "Contractor".
 2. ANSI/AISC 360-05 "Specifications for Structural Steel Buildings", March 9, 2005.
 3. AISC 348-04 "Specifications for Structural Joints using ASTM A325 or A490 Bolts" approved by Research Council on Structural Connections of the Engineering Foundation (RCSC), June 30, 2004.
 4. AWS D1.1: "Structural Welding Code", latest edition.
 5. "Steel Structures Painting Manual," Volumes 1 and 2, Steel Structures Painting Council.

6. ASTM A6-04a: "Specification for the General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling."
- B. Work in this section shall be subject to all applicable provisions of State and local building and safety codes and all other codes referenced therein.
- C. Any material or operation specified by reference to published specification of a manufacturer shall comply with requirements of standards listed herein. In case of a conflict between referenced specifications and project specifications, project specifications shall govern.
- D. Structural Steel Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- E. Structural Steel Erector Qualifications: A qualified erector who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- F. Qualifications for Welding Work: Contractor shall retain a testing laboratory to provide qualification of welding processes and welding operators in accordance with AWS "Standard Qualification Procedure". Provide certification that welders employed in work have as follows:
 1. Satisfactorily passed AWS qualification tests and have been continuously employed by Contractor for previous twelve (12) months, or
 2. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within previous twelve (12) months. If recertification of welders is required, retesting will be Contractor's responsibility.
- G. Quality Control: The Contractor shall be responsible for quality control of all materials and workmanship, including workmanship and material furnished by subcontractors and suppliers.
 1. The Contractor shall be responsible for correction of work which does not conform to specified requirements including, but not limited to, strength of material, fit up, conformance to tolerance requirements, conformance to welding requirements, conformance to connection requirements, painting, and all other items indicated in the specifications or referenced standards.
 2. The Contractor shall correct and/or replace all nonconforming work in a manner and with materials approved by the Structural Engineer. If steel is damaged or does not fit, the Contractor shall prepare and submit formal documentation showing proposed corrective measures to the Architect. No modifications shall be made to the steel until such documentation has been approved by the Architect and Structural Engineer. The Contractor shall be responsible for the cost of such corrective work, including architectural and engineering services.
 3. Materials and fabrication procedures are subject to inspections and tests in the steel fabrication shop and the job site. Such inspections and tests will be performed by an independent testing laboratory (ITL) employed by the Owner.
 4. The Contractor shall provide access for the ITL to places where structural steel work is being fabricated or produced, so required inspection and testing can be accomplished.
 5. The Contractor and/or Fabricator shall correct deficiencies in structural steel work, which ITL's test reports have indicated to be not in compliance with requirements.

6. The Contractor shall coordinate and provide allowance in construction scheduling for ITL to perform specified tests and inspections in a timely manner. Cost of time lost in schedule to make corrections and to retest defective work shall be borne by the Contractor.
7. The Contractor shall pay for any re-testing required to confirm acceptability of non-conforming work.
8. Inspections and tests performed by the Owner, as part of the quality assurance program will not relieve the Contractor of the responsibility to provide materials and workmanship in compliance with specified requirements.

1.6 INSPECTION AND TESTING

- A. The Owner will employ, at his expense, an independent testing laboratory (ITL) to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports. Reports shall be furnished directly to the Architect, Owner, Structural Engineer and Contractor. The Owner reserves the right to perform non-destructive tests (x-ray, ultrasound, etc.) on any weld.
 1. ITL shall conduct and interpret tests and state in each report whether test specimens comply with requirements and specifically state any deviations there from.
 2. ITL shall perform additional tests on all work originally shown to be non-complying, as necessary to confirm compliance with requirements.
- B. Structural Steel Framing is subject to Special Inspections in conformance with Chapter 17 of the International Building Code. Refer to the "Statement of Special Inspections" for scope of testing work and identification of responsible agents.
- C. Bolted Connections: Shop bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A325 or A 490 Bolts."
- D. Welded Connections: Welds shall be visually inspected according to AWS D1.1.
 1. In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 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.
 - d. Radiographic Inspection: ASTM E 94.
- E. Fabrication Shop Inspection/Testing: ITL shall conduct shop inspections and tests as required during fabrication of structural steel with reports to include shop welder's certifications, type and location of all defects found during inspection, and measures performed to correct such defects. ITL shall obtain copies of welder certifications for all welders assigned to the project.
 1. Inspect/test during fabrication of structural steel assemblies in accordance with AWS D1.1 as well as the following:
 - a. Perform visual inspections of all welds. Check for size, pinholes, undercut, and overlap. Any visual indication of cracks should be checked further using magnetic particle testing methods.

- b. Perform visual inspections of all copes and cuts in members. Check for notches and sharp re-entrant corners.
 - c. Perform non-destructive testing of welds as follows:
 - 1) Partial penetration welds: one (1) spot test per weld using magnetic testing techniques.
 - 2) Full penetration welds: test entire length of all welds; use radiographic or ultrasonic testing techniques.
 - d. All welds that fail shall be rewelded and retested until they pass. When spot testing is designated, each spot shall cover at least 4" of weld length. When spot testing reveals indication of flaws requiring repair, two additional spots in that joint shall be tested. If indications of flaws requiring repair are revealed in either of two spot tests, entire length of weld in that welded joint shall be tested.
 - e. Inspect and test all shop attachments of stud shear connectors to structural steel members in accordance with procedures directed in AWS D1.1, Section 7.7.
- F. Erector's Field Inspection/Testing: Conduct field inspections and tests as required during erection and installation of structural steel assemblies in accordance with AWS D1.1 for welding and AISC Specification for Structural Joints for high strength bolted connections and as indicated below. Reports shall include bolt, nut and washer verification, bolt torque verification at slip-critical connections, type and location of all defects found during inspection, and measures performed to correct such defects. ITL shall obtain copies of welder certifications for all welders assigned to the project.
- 1. Inspect and test during erection of structural steel assemblies in accordance with AWS D1.1, AISC Specification for Structural Joints and as follows:
 - a. Perform visual inspection of all welds. Check for size, pinholes, undercut, and overlap. Any visual indication of cracks should be checked further using magnetic particle testing methods.
 - b. Perform visual inspection of all field cut or coped members. Check for notches or sharp re-entrant corners.
 - c. Perform non-destructive tests of welds as follows:
 - 1) Partial penetration welds - one (1) spot test per weld using magnetic particle testing techniques.
 - 2) Full penetration welds - Test entire length of all field welds. Use radiographic or ultrasonic testing techniques.
 - d. Correction of rejected work shall be same as described under Fabrication Shop Inspection/Testing.
 - e. Visually inspect all High-Strength Bolted Connections for snug tight fit. Confirm that all bolting indicated in the fabricator's shop drawings and/or the Construction Documents has been fully provided.
 - f. Test bolts in all Slip Critical bolted connections, in conformance with the AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts," including Commentary, as well as the following:
 - 1) All testing of slip critical connections shall be made while the work is in progress.
 - 2) ITL shall observe the tension calibration procedures and shall monitor the installation of slip critical bolts to determine that all plies of connected material have been drawn together and that the selected tightening procedure is properly used.
 - 3) Minimum bolt tension shall be given in Table 4 of the referenced Specification.

- 4) A hydraulic tension calibrating device is required to be on the site whenever slip critical connections are being installed and tightened. The calibrator shall be used to test complete fastener assemblies as will be used with any method of tightening to assure the suitability of bolts, nuts and lubrication, and to confirm the ability of the assemblies to provide minimum bolt tension.
- 5) Bolts required to be slip critical shall be tightened by one of the following methods:
 - a) Turn-of-the-nut Tightening. At start of work, test to assure method used (number of turns of the nut from snug tight) develops the required tension.
 - b) Calibrated Wrench Tightening. Installation procedures shall be calibrated at least once each working day to assure method used (torque) develops the required tension.
 - c) Tightening of Alternate Design Bolts. At the start of work, test to assure the Alternative Bolt develops the required tension.
 - d) Direct Tension Indicator Tightening. At the start of work, test to demonstrate that the tension indicating devices indicate development of the required tension.
- 6) Each specified tightening method shall be tested with sample assemblies representative of actual field conditions, with at least 3 bolts for each diameter, length and grade of bolt to be used. Tests shall indicate that method used can develop not less than 5 percent greater than the bolt tension required by Table 4.
- g. Check number, length and spacing of studs. Evaluate weld quality by visual inspection of welds for full 360 degree fusion and by striking each stud with a six (6) pound hammer. Stud shear connector testing shall comply with the requirements of AWS 1.1.
 - 1) At the start of each production period for all welders:
 - a) Examine first two (2) studs for full 360 degree weld fusion.
 - b) Test first two (2) studs by bending to approximately 30 degrees from vertical, toward nearest end of beam, by hammering, without fracturing welds.
 - c) If either or both of the studs do not exhibit full 360 degree weld fusion, or if on testing failure occurs in the welds, then the welding procedure shall be corrected and another two (2) test studs shall be welded and likewise tested prior to beginning production. Repeat this operation until proper welding and successful testing is achieved.
 - d) None of these test studs are to be considered as part of the required shear connectors.
 - 2) For a minimum of two studs per beam and for all studs where welds do not exhibit full 360 degree fusion around stud:
 - a) Bend studs to approximately 15 degrees from vertical, opposite from the direction of the missing weld, by hammering, without fracturing welds.
 - b) If a failure occurs in either of the studs tested, then another two (2) studs shall likewise be tested. If failure occurs in either of the second pair, then all studs on the beam shall be tested.
 - c) Studs passing test need not be hammered back to vertical.
 - d) Studs failing test shall be replaced and retested.

- h. Verify steel deck is attached to structural supports in accordance with manufacturer's recommendations, the Construction Documents and approved shop drawings.

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, platforms, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 2. 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.

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.
- C. Structural steel erection contractor is responsible for checking "as-built" position of anchor bolts and other items cast into concrete or embedded in masonry. Erector shall notify Contractor of all items not positioned within acceptable tolerances.
- D. Contractor will be responsible for corrective work required by misplacement of such items. Such work is subject to approval of Architect.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
 - 1. W-Shapes: 60 percent.
 - 2. Channels, Angles: 60 percent.
 - 3. Plate and Bar: 25 percent.
 - 4. Cold-Formed Hollow Structural Sections: 25 percent.
 - 5. Steel Pipe: 25 percent.
 - 6. All Other Steel Materials: 25 percent.

- B. W-Shapes and rolled steel shapes: ASTM A 992 or ASTM A 572, Grade 50.
- C. Steel Plates, Channels, Angles, M, S-Shapes, and Bars: ASTM A 36 or ASTM A 572, Grade 50.
- D. Square and Rectangular Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B.
- E. Steel Pipe: ASTM A 53, Type E or S, Grade B.
- F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563, Grade C, heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain, except hot-dip zinc coating, ASTM A 153, Class C, or mechanically deposited zinc coating, ASTM B 695, Class 50, where indicated.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy hex steel structural bolts; ASTM A 563, Grade DH, heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain, except hot-dip zinc coating, ASTM A 153, Class C, or mechanically deposited zinc coating, ASTM B 695, Class 50, where indicated.
- C. Headed Stud Type Shear Connectors (Studs): Meeting all requirements of Section 7 of AWS 1.1. ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B, with dimensions complying with AISC Specifications.
- D. Headed and unheaded Anchor Rods: ASTM F 1554, Grade 36, ASTM A 36, ASTM A 307, Grade A.
 - 1. Configuration: Straight or hooked as indicated.
 - 2. Nuts: ASTM A 563 heavy hex carbon steel.
 - 3. Plate Washers: ASTM A 36 carbon steel.
 - 4. Washers: ASTM F 436 hardened carbon steel.
 - 5. Finish: Plain. Except hot-dip zinc coating, ASTM A 153, Class C or mechanically deposited zinc coating, ASTM B 695, Class 50, where indicated.
- E. Threaded Rods: ASTM A 193, ASTM A 354, ASTM A 449, A 572/A 572M, Grade 50 ASTM A 36, or ASTM A 307, Grade A.
 - 1. Nuts: ASTM A 563 heavy hex carbon steel.
 - 2. Washers: ASTM F 436 hardened, or ASTM A 36 carbon steel.
 - 3. Finish: Plain. Except hot-dip zinc coating, ASTM A 153, Class C or mechanically deposited zinc coating, ASTM B 695, Class 50, where indicated.
- F. Clevises and Turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.
- G. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.
- H. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

- I. Drilled-In Expansion Bolts:
 - 1. Wedge Anchors: Diameter and minimum capacity shown on drawings; minimum safety factor of 4. Install into concrete or solid grouted concrete masonry with minimum embedment according to manufacturer's recommendations. Subject to compliance, one of the following:
 - a. Kwik Bolts by Hilti
 - b. Wedge-All by Simpson Strong-Tie Company, Inc.
 - c. Rawl-Stud by Rawlplug Co.
 - d. Trubolt by ITW Ramset
 - e. Redhead Wedge Anchors by ITT Phillips Drill Company.
 - f. Safety Bolt and/or Wedge Anchor by Liebig International
 - 2. Sleeve Anchors: Diameter and minimum capacity shown on drawings; minimum safety factor of 4. Install into brick or hollow concrete masonry with minimum embedment according to manufacturer's recommendations. Subject to compliance, one of the following manufacturers:
 - a. Hilti
 - b. Sleeve-All by Simpson Strong-Tie Company, Inc.
 - c. Rawlplug Co.
 - d. ITW Ramset ITT Phillips
 - 3. Epoxy Anchors: Diameter shown on drawings. Install into concrete or solid grouted concrete masonry with minimum embedment according to manufacturer's requirements. Subject to compliance, one of the following:
 - a. HVA Adhesive Anchor System with HEA capsule and HFA insert by Hilti.
 - b. Epoxy-Tie by Simpson Strong-Tie Company, Inc.
 - c. Rawl Chem-Stud System with Chem-Stud capsule and internally threaded inserts by The Rawlplug Company, Inc.
- J. Structural Slide Bearings: Low-friction assemblies, of configuration indicated, that provide vertical transfer of loads and allow horizontal movement perpendicular to plane of expansion joint while resisting movement within plane of expansion joint.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Fluorocarbon Company Limited.

2.3 ELECTRODES FOR WELDING

- A. Comply with Table 3.1 of AWS D1.1. Minimum electrodes shall be E70XX.

2.4 PRIMER PAINT

- A. Refer to Architects drawings and specifications for final paint color and for finish requirements of structural steel. Primer paints shall be compatible with final finish paint formulation.
- B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20 or ASTM A 780.

2.5 NONSHRINK GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, premixed, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time. Minimum compressive strength shall be 2500 psi after one day and 7000 psi after 28 days when test according to ASTM C 109.

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, with steel erector present, for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FABRICATION

- A. Shop Fabrication and Assembly: 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. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
 - 3. Mark and match-mark materials for field assembly. Fabricate for delivery sequence, which will expedite erection and minimize field handling of materials. Fabricator shall coordinate fit-up procedures with erector.
 - 4. Where finishing is required, complete structural-steel assemblies, including welding of units, before starting shop-priming operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
 - 5. Fabricate all beams with mill camber up.
 - 6. All re-entrant corners caused by cuts or copes in members shall be notch-free and shall be rounded to a minimum radius of $\frac{1}{2}$ ".
- B. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts."
- C. Welded Construction: Comply with AWS Code for procedures, appearance, and quality of welds, and methods used in correcting welding work.
 - 1. Minimum sizes and materials for welds shall be in accordance with AISC Specification Tables, Section J.
 - 2. Shop welders shall be certified according to AWS procedures for the welding process and position to be used.
 - 3. Heat, input, length of weld, and sequence of welding shall be controlled to prevent distortions.
 - 4. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

- D. 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.
- E. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- F. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- G. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning or SSPC-SP 2 "Hand Tool Cleaning."
- 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 and manufacturer's written instructions.
- I. Holes: Provide holes required for securing other work to structural steel and for passage of other work 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. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

3.3 SHOP CONNECTIONS

- A. Connections: Weld or bolt shop connections. Bolt field connections, except where welded connections or other connections are indicated. Provide high-strength threaded fasteners for all bolted connections other than anchor bolts.
 - 1. Single plate shear tab connections may be used. Single plate connections shall be designed in strict accordance with the AISC requirements. Horizontal short slotted holes shall be provided in the web of the beam to accommodate beam end rotation. Bolts shall be bearing type, snug tight only, unless indicated otherwise.

3.4 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials.
 - 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 paint system supplier's requirements for compatibility of the finish paint system.
 - 1. Coordinate all shop painting with Architect's painting requirements.

- C. Completely prime paint all faces and edges of steel members, including any surfaces not exposed to view, excepting the inside surfaces of closed shapes and surfaces or edges of surfaces in direct bearing with another element. Provide full coverage of joints, corners, edges and exposed surfaces.

3.5 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123. Fill vent holes and grind smooth after galvanizing.
- B. Galvanize loose steel lintels located in exterior walls and angles and plates that directly support exterior panels from suspended assemblies.

3.6 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.

3.7 ERECTION

- A. Surveys: Perform surveys with personnel experienced with transit and level to accurately locate building lines and locations of columns and column foundations prior to erection of structural steel. Check elevations of concrete and masonry bearing surfaces; and locations of anchor bolts and similar devices before erection work proceeds.
 - 1. Report any discrepancies to the Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect and Structural Engineer.
- B. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- C. Temporary Planking: Provide planking and working platforms necessary to effectively complete work.
- D. Anchor Bolts: Furnish anchor bolts/other connectors required for securing structural steel to foundations and other in-place work. Furnish templates/other devices as necessary for presetting bolts and other anchors to accurate locations.
- E. Base Plates and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.

2. 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 base or bearing plate before packing with grout.
 3. Promptly pack specified non-shrink grout solidly between bearing surfaces and base or bearing 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.
- F. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- G. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact 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 in service.
- H. Splice members only where indicated.
- I. Errors in shop fabrication or shipping damage preventing proper erection or fit-up shall be reported to the Architect and Structural Engineer and an approved correction shall be obtained prior to proceeding with affected work.
1. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.
 2. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- J. Provide miscellaneous supplemental framing for support of steel decking where columns, other framing members, or other openings interrupt normal deck bearing.

3.8 FIELD 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 and slip critical.
 - a. Snug tightened is defined as that attained with several impacts on the impact wrench or the full effort of a man using an ordinary spud wrench.
 - b. Tighten high strength bolts in slip-critical connections in accordance with the AISC Specifications.
 - c. Do not torque bolts in bearing connections without the approval of the Structural Engineer.
 2. All bolts shall be well lubricated at the time of installation. Dry or rusty bolts are not permitted.
- B. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

- C. Welded Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Load and Resistance Factor Design Specification for Structural Steel Buildings" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Field welders shall be certified according to AWS procedures for the welding process and position to be used.
 - 3. Before any field welding is performed, attention shall be paid to surface preparation, fit-up, cleanliness of materials, and back-up materials or welds.
 - a. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.9 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION

SECTION 05 21 00 – STEEL JOISTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. K-series steel joists.
 - 2. Joist accessories.

1.2 PERFORMANCE REQUIREMENTS

- A. Design joists to withstand design loads with live load deflections no greater than the following:
 - 1. Roof Joists: Vertical deflection of 1/360 of the span.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with following unless otherwise shown or specified:
 - 1. "Standard Specification for Open Web Steel Joists, K-Series", Steel Joist Institute (SJI).
 - 2. "Recommended Code of Standard Practice for Steel Joists and Joist Girders", Steel Joist Institute.
 - 3. AWS D1.1 "Structural Welding Code - Steel", American Welding Society.
 - 4. AWS D1.3 "Structural Welding Code – Sheet Steel", American Welding Society.
- B. Manufacturer Qualifications: A firm experienced in manufacturing joists similar to those indicated for this Project and with a record of successful in-service performance.
 - 1. Manufacturer must be certified by SJI to manufacture joists complying with SJI standard specifications and load tables.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3 "Structural Welding Code--Sheet Steel."

1.4 SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product indicated.
- B. Shop Drawings: Detailed drawings and manufacturer's Bills of Materials, showing layout, mark, number, type, location, and spacing of joists. Include joining and anchorage details, bracing, bridging, accessories; splice and connection locations and details; and attachments to other construction.

1.5 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel: Comply with SJI's Specifications for chord and web members.
- B. 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. Finish to match joists.
- C. High-Strength Bolts and Nuts: ASTM A 325, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers. Finish to match joists.
- D. Welding Electrodes: Comply with AWS standards.

2.2 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.3 K-SERIES STEEL JOISTS

- A. Manufacture steel joists 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; of joist type indicated.
 - 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.

2.4 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.
- B. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.
- C. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.5 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories to be primed 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 shop coat of primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing, with Installer present, 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

- 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. Space, adjust, and align joists accurately in location before permanently fastening.
 - 2. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

3. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.
- C. Fastening Joists: Field weld joists to supporting steel framework in accordance with SJI Specifications for type of joists used. 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.
 1. K and CS Series joists shall be welded to supports with 1/8" fillet welds, one each side, 2 inches long.
 2. K and CS Series joists at column centerlines shall be bolted to structural steel supports with 2, 1/2" diameter bolts (minimum). Where joists do not space on centerlines, provide bolted connections for each joist adjacent to the centerline.
- D. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.
 1. For K and CS series joist lengths 40 feet and longer, install a center row of bolted bridging to provide lateral stability before slackening of hoisting lines.

3.3 REPAIRS AND PROTECTION

- A. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates and abutting structural steel.
 1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
 2. Apply a compatible primer of the same type as the shop primer used on adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 31 00 – STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Roof deck.
 - 2. Composite steel floor deck.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with following unless otherwise shown or specified:
 - 1. AISI "Specification for the Design of Cold-Formed Steel Structural Members"
 - 2. AWS D1.1 "Structural Welding Code-Steel"
 - 3. AWS D1.3 "Structural Welding Code-Sheet Steel"
 - 4. SDI "Design Manual for Floor Decks and Roof Decks"
 - 5. SDI "Specifications for Steel Roof Decks, Composite Steel Floor Decks and Non-Composite Steel Form Decks".
- B. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
 - 1. Welded decking in place is subject to inspection by the independent testing lab. Remove work found to be defective and replace with new acceptable work.
- D. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

1.4 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. Remove and replace work that does not comply with specified requirements.

- C. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

1.5 DESIGN OF STEEL DECK

- A. Minimum gauge of steel deck is shown on the drawings. The deck manufacturer shall be responsible for selecting the required deck thickness to safely support and meet all SDI performance criteria for the superimposed design loads for all conditions where less than 3-span continuous decking is detailed on the erection plans provided by the deck supplier. Refer to the "General Notes" in the structural drawings for superimposed design loads.
- B. Section properties of the deck units are to be calculated in conformance with AISI publication, "Specification for the Design of Cold-Formed Steel Structure Members". Steel deck shall conform to the requirements of the "Steel Deck Institute Design Manual for Composite Decks, Form Decks and Roof Decks".

1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions for each type of decking and accessory specified. Provide suppliers specifications for mechanical fasteners used in lieu of welding for fastening decks to supporting structures.
- B. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
- C. Shop Drawings: Submit detailed drawings showing layout, type and manufacturer of deck panels; anchorage details, closures, edge strips, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories. Shop drawings submitted shall bear Contractor's approval stamp accepting responsibility for dimensions, quantities, and coordination of other trades.

1.7 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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering steel deck products that may be incorporated into the Work include, but are not limited to, the following:

1. Steel Deck:
 - a. Consolidated Systems, Inc.
 - b. Nucor Corp.; Vulcraft Div.
 - c. United Steel Deck, Inc.
 - d. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.
- B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

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. Galvanized and Shop-Primed Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 40, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive off-white primer.

2.3 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 and Shop-Primed Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33 G60 zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer's standard white baked-on, rust-inhibitive primer.

2.4 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.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

- F. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- G. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth. Form to provide tight-fitting closures at open ends of cells or flutes and sides of decking.
- H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- I. Galvanizing Repair Paint: Minimum 94 percent zinc-dust content (by weight) paint for repair of damaged galvanized surfaces. Prepare and repair surfaces in accordance with ASTM A 780.

PART 3 - EXECUTION

3.1 FABRICATION

- A. General: Form deck units in lengths to span 3 or more supports.
- B. Steel Roof Deck Units: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30.

3.2 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.3 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, final placement drawings and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Coordinate and cooperate with structural steel erector in locating deck bundles to prevent overloading of supporting members.
 - 1. Do not use deck units for storage or working platforms until permanently secured.
- 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 in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.

- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, 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. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.4 ROOF DECK INSTALLATION

- A. Fasten units to supporting steel members by not less than 5/8" diameter arc spot (puddle) welds, or elongated welds and seam welds of equal perimeter, but not less than 1½" long. Welding machine power settings shall be such that burn-off rates are between 0.15 and 0.25 inches of rod per second with E60 or E70, 5/32-inch rods.
 - 1. Comply with AWS requirements and procedures for manual shielded steel arc welding, appearance, and/or quality of welds, and methods used in correcting welding work. Welding washers are required for all deck thinner than 22 gauge.
- B. Make side lap attachments between supports with Buildex self-drilling TEKS #12 or larger screws. Side lap fasteners shall be provided at mid-span of deck between supports for any deck spans exceeding 5 feet and at closer spacing where required for lateral force resistance. Button punched side lap fastening is not permitted.
- C. Attachments shall be spaced not more than 12" o.c. at every support and at closer spacing where required for lateral force resistance.
 - 1. Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support.
- D. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

3.5 COMPOSITE FLOOR DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Diameter: 5/8 inch, nominal.
 - 2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches 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, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 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, with butted end joints.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.6 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

SECTION 05 40 00 – COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior and exterior load-bearing wall framing.
 - 2. Exterior non-load-bearing wall framing.
 - 3. Floor joist framing.
 - 4. Ceiling joist framing.

1.2 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed cold-formed steel framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- C. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1.3 SUBMITTALS

- A. Product Data: From manufacturers for each type of cold-formed steel framing product and accessory indicated.
- B. LEED Submittal:
 - 1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
- C. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, deformation, and other damage during delivery, storage, and handling.

- B. Store cold-formed steel framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed steel framing that may be incorporated into the Work include, but are not limited to, the following:
 - 1. ClarkWestern Building Systems.
 - 2. Dietrich Metal Framing.
 - 3. Marino/Ware.
 - 4. Telling Industries

2.2 MATERIALS

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Steel Sheet: ASTM A 1003, Structural Grade, Type H, metallic coated, of grade and coating as follows:
 - 1. Grade: 33 ksi or 50 ksi as required by structural drawings.
 - 2. Coating: G90 for exterior applications.

2.3 INTERIOR 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 Uncoated-Steel Thickness: 0.0329 inch.
 - 2. Flange Width: 1-5/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
 - 1. Minimum Uncoated-Steel Thickness: Matching steel studs.
 - 2. Flange Width: 1-1/4 inches.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428.
- D. Steel Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch.

2.4 EXTERIOR 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 Uncoated-Steel Thickness: 0.0428 inch (18 ga.).
 - 2. Depth: As Indicated.
 - 3. Flange Width: 1-5/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Uncoated-Steel Thickness: Matching steel studs.
 - 2. Flange Width: 1-1/2 inches.
- C. Single Deflection Track (non-load-bearing applications only): Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads, and as follows:
 - 1. Minimum Uncoated-Steel Thickness: 0.0677 inch (14 ga.).
 - 2. Flange Width: 2 inches.
- D. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. The Steel Network, Inc.

2.5 FLOOR JOIST FRAMING

- A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, unpunched or punched, with stiffened flanges, and as follows:
 - 1. Minimum Uncoated-Steel Thickness: 0.0428 inch.
 - 2. Flange Width: 1-5/8 inches, minimum.
- B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Uncoated-Steel Thickness: Matching steel joists.
 - 2. Flange Width: 1-5/8 inches, minimum.

2.6 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329.
2. Flange Width: 1-5/8, minimum.

2.7 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C or mechanically deposition according to ASTM B 695, Class 50.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 4 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.

2.9 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
 1. Fabricate framing assemblies using jigs or templates.
 2. Cut framing members by sawing or shearing; do not torch cut.
 3. Fasten cold-formed steel framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 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 metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
 1. Cut framing members by sawing or shearing; do not torch cut.
 2. Fasten cold-formed steel framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

- b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
- E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion and control joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: 24 inches, unless shown otherwise on drawings.
- B. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
 - 1. Stud Spacing: 16 inches minimum, as indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where wall-framing continuity is interrupted by floor framing. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings.
 - 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced 36 inches or the dimension indicated on Shop Drawings apart. Fasten at each stud intersection.
 - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 NON-LOAD-BEARING EXTERIOR WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to bottom track, unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches maximum, except 12" on center within 12 feet of any building corner, or less as indicated by design.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure. Do not attach vertical studs or sheathing to deflection track.
 - 2. Connect vertical deflection clips to bypassing and infill studs and anchor to primary building structure.
- E. Install horizontal bridging in non-load-bearing wall studs, spaced in rows indicated on Shop Drawings but not more than 54 inches apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges. Install solid blocking at every other stud.
 - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
 - 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
 - 1. Joist Spacing: 16 inches minimum, as indicated.
- D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated.
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at each end of joists and at intervals indicated. Fasten bridging at each joist intersection as follows:
 - 1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 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. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 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 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Miscellaneous steel framing and supports.
- B. Loose bearing and leveling plates.
- C. Steel weld plates and angles.
- D. Miscellaneous steel trim.
- E. Metal ladders and cages
- F. Loose steel lintels.

1.2 SUBMITTALS

- A. Product Data: For the following:
 - 1. Grout.
- B. LEED Submittal:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
- C. Shop Drawings: Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- D. Templates: For anchors and bolts.

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.
- B. Ferrous Metals:
 - 1. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

2. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
3. Steel Tubing: ASTM A 500, cold-formed steel tubing.
4. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

C. Nonferrous Metals:

1. Aluminum Extrusions: ASTM B 221, alloy 6063-T6.
2. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.2 FASTENERS

- A. General: Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Cast-in-Place Anchors in Concrete: Threaded or wedge type; 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, hot-dip galvanized per ASTM A 153/A 153M.

2.3 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI #79.
- B. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 1. Products:
 - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
 - b. Carboline Company; Carbozinc 621.
 - c. ICI Devoe Coatings; Catha-Coat 313.
 - d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
 - e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
 - f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
 - g. Tnemec Company, Inc.; Tneme-Zinc 90-97.
- C. Galvanizing Repair Paint: SSPC-Paint 20, high-zinc-dust-content paint for regalvanizing welds in steel.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.
- E. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.4 FABRICATION

- A. General: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
 - 1. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
 - 2. Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds smooth and blended.
 - 3. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
 - 4. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
 - 5. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 24 inches o.c.
- B. Miscellaneous Framing and Supports: Provide steel framing and supports not specified in other Sections as needed to complete the Work. Fabricate units from steel shapes, plates, and bars of welded construction. Cut, drill, and tap units to receive hardware, hangers, and similar items.
- C. Loose Steel Lintels: Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
 - 1. Lintels in Exterior Walls: Galvanize.
- D. Loose Bearing and Leveling Plates: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts.
- E. Miscellaneous Steel Trim: 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. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Exterior Miscellaneous Steel Trim: Galvanize.
- F. Metal Ladders: Comply with ANSI A14.3, unless otherwise indicated.
 - 1. Steel Ladder Construction: Flat bar siderails, with 3/4-inch- diameter steel bar rungs fitted in centerline of siderails, plug-welded, and ground smooth on outer rail faces. Provide nonslip surfaces on top of each rung.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal fabrications after assembly.

B. Steel and Iron Finishes:

1. Hot-dip galvanize items as indicated to comply with ASTM A 123/A 123M or ASTM A 153/A 153M as applicable.
2. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below for environmental exposure conditions of installed metal fabrications:
 - a. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - b. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
3. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting," for shop painting.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. General: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, with edges and surfaces level, plumb, and true.
 1. Fit exposed connections accurately together. Weld connections that are not to be left as exposed joints but cannot be shop welded. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication.
 2. Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
 3. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- B. Set bearing and leveling plates on cleaned surfaces using wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts and pack solidly with nonshrink, nonmetallic grout.
- C. Touch up surfaces and finishes after erection.
 1. Painted Surfaces: Clean field welds, bolted connections, and abraded areas and touch up paint with the same material as used for shop painting.
 2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 05 51 00 - METAL STAIRS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Steel stairs with concrete-filled treads.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Uniform Load: 100 lbf/sq. ft..
 - 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 - 5. Limit deflection of treads, platforms, and framing members to L/240 or 1/4 inch, whichever is less.

1.3 SUBMITTALS

- A. Product Data: For metal stairs.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: Indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- 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.

PART 2 - PRODUCTS**2.1 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. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than **25** percent.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

2.2 MISCELLANEOUS MATERIALS

- A. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- B. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.
- C. Fasteners: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- D. Shop Primers: Provide primers that comply with Section 09 91 00 – Painting.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- F. Concrete Materials and Properties: Comply with requirements in Section 03 30 00 - Cast-in-Place Concrete for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
- G. Welded Wire Fabric: ASTM A 185/A 185M, 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated.

2.3 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.

3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without impairing work.
- D. 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 2 welds: completely sanded joint, some undercutting and pinholes okay
- E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
- F. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.4 STEEL-FRAMED STAIRS

- A. Stair Framing:
 1. Fabricate stringers of steel plates or channels.
 2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements
 3. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
 4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below.
 5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- B. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly.

- C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
- D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning
- E. Apply shop primer to uncoated surfaces of metal stair components. 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 INSTALLATION

- A. 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.
- B. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication.
- D. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- E. Place and finish concrete fill for treads and platforms to comply with Section 03 30 00 - Cast-in-Place Concrete.
 - 1. Install abrasive nosings with anchors fully embedded in concrete.

3.2 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Aluminum Tube Railings - Exterior Loading Dock
- B. Steel Railings - Interior Stair
- C. Stainless Steel Railings

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 3. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
 - b. Uniform load of 25 lbf/sq. ft. applied horizontally.
 - c. Infill load and other loads need not be assumed to act concurrently.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 SUBMITTALS

- A. Product Data: For mechanically connected railings, grout, anchoring cement, and paint products.
- B. LEED Submittal:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

- a. Include statement indicating costs for each product having recycled content.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Samples: For each exposed finish required.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

PART 2 - PRODUCTS

2.1 METALS

- A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.
- B. Aluminum: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
 - 1. Extruded Bars and Tubing: ASTM B 221, Alloy 6063-T5/T52.
 - 2. Plate and Sheet: ASTM B 209, Alloy 6061-T6.
 - 3. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.
 - 4. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.
- C. Stainless Steel:
 - 1. Tubing: ASTM A 554, Grade MT 304
 - 2. Pipe: ASTM A 312/A 312M, Grade TP 304.
 - 3. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20
 - 4. Plate and Sheet: ASTM A 666, Type 304
- D. Steel and Iron:
 - 1. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
 - 2. Tubing: ASTM A 500 (cold formed or ASTM A 513, Type 5 (mandrel drawn).
 - 3. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 4. Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 5. Castings: Either gray or malleable iron, unless otherwise indicated.
 - a. Gray Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.

- b. Malleable Iron: ASTM A 47/A 47M.

2.2 MISCELLANEOUS MATERIALS

- A. Fasteners: Provide concealed fasteners, unless unavoidable or standard for railings indicated.
 - 1. Aluminum Railings: Type 304 stainless-steel fasteners.
- B. Anchors: Provide cast-in-place 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.
- C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- D. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer.
- E. Grout and Anchoring Cement: Factory-packaged, nonshrink, nonmetallic grout complying with ASTM C 1107; or water-resistant, nonshrink anchoring cement; recommended by manufacturer for exterior use.

2.3 FABRICATION

- A. General: Fabricate railings to comply with design, dimensions, and details indicated, but not less than that required to support structural loads.
- B. 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.
- C. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings.
- D. Form changes in direction by inserting prefabricated elbow fittings.
- E. Form curves by bending in jigs to produce uniform curvature; maintain cross section of member throughout bend without cracking or otherwise deforming exposed surfaces.
- F. Close exposed ends of railing members with prefabricated end fittings.
- G. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.

2.4 FINISHES**A. Aluminum:**

1. Mechanical Finish: AA-M12 (Mechanical Finish: nonspecular as fabricated).
2. Color: Selected by Architect from Manufacturer's full range.

B. Stainless Steel:

1. Directional Satin Finish: No. 4.

C. Steel and Iron:

1. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. 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.

PART 3 - EXECUTION**3.1 INSTALLATION****A. General:** Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation.

1. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
2. 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.

B. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.**C.** Install removable railings at equipment to be secure and stable, or as indicated in drawings.**D.** Anchor posts in concrete by inserting into preset steel pipe sleeves and grouting annular space.**E.** Anchor posts to metal surfaces with oval flanges.**F.** Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.**G.** Attach handrails to wall with wall brackets.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

2. For steel-framed partitions, fasten to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.

H. Adjusting and Cleaning:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting.
2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wood blocking, cants, and nailers.
- B. Wood furring and grounds.
- C. Fire Treated Plywood.

1.2 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.
 - 1. Include data for wood-preservative and fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.4: For composite-wood products, documentation indicating that product contains no urea formaldehyde.
 - 2. Certificates for Credit MR 7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
 - a. Include statement indicating costs for each certified wood product.
- C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.
- D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 - 1. Wood-preservative-treated wood.
 - 2. Fire-retardant-treated wood.

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 or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPAC2
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWPAC20 (lumber) and AWPAC27 (plywood).
 - 1. Use Exterior type for exterior locations and where indicated.
 - 2. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings, and the following:

1. Framing for raised platforms.
2. Concealed blocking.
3. Horizontal lids over bathrooms
4. Roof construction.
5. 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. Cants.
 4. Furring.
 5. Grounds.
- B. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
 1. Mixed southern pine, No. 2 grade; SPIB.
 2. Eastern softwoods, No. 2 Common grade; NeLMA.

2.5 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified.
 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Power-Driven Fasteners: NES NER-272.
- C. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

2.7 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- C. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

3.2 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wall sheathing.
- B. Back of parapets

1.2 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For adhesives, including printed statement of VOC content.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WALL SHEATHING

- A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
 - 1. Type and Thickness: Regular 1/2 inch thick.
 - 2. Type and Thickness: Type X, 5/8 inch thick.

2.2 FASTENERS

- A. General: Provide fasteners of size and type indicated.
 - 1. For wall and roof sheathing panels, provide fasteners with corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

2.3 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing Board: Elastomeric silicone joint sealant recommended by sheathing manufacturer.
- B. Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self-adhering glass-fiber tape, of type recommended by sheathing and tape manufacturers.

2.4 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Self-adhesive, rubberized-asphalt compound, bonded to a high-density, polyethylene film to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION**3.1 INSTALLATION, GENERAL**

- A. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- B. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that exclude exterior moisture.
- C. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 3. Install boards with a 1/4-inch gap where they abut masonry or similar materials.

3.3 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturers written instructions.
 - 1. Lap seams and junctures with other materials at least 4 inches, except that at flashing flanges of other construction, laps need not exceed flange width.
 - 2. Lap flashing over weather-resistant building paper at bottom and sides of openings.
 - 3. Lap weather-resistant building paper over flashing at heads of openings.
 - 4. After flashing has been applied, roll surfaces with a hard rubber or metal roller.

END OF SECTION

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Plastic-laminate cabinets.
- B. Plastic-laminate countertops.
- C. Solid-surfacing-material countertops.
- D. Decorative Metal
- E. Shop finishing of woodwork.

1.2 SUBMITTALS

- A. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- B. Samples:
 - 1. Lumber and panel products with shop-applied opaque finish, for each finish system and color, with exposed surface finished.
 - 2. Plastic-laminates, for each type, color, pattern, and surface finish.
 - 3. Thermoset decorative panels, for each type, color, pattern, and surface finish.
 - C. Solid-surfacing materials.
- D. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.4:
 - a. For each composite-wood product used, documentation indicating that the bonding agent contains no urea formaldehyde.
 - b. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.
 - 2. Product Data for Credit Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer recycled content. Included statement indicating cost for each product having recycled content.
 - 3. Certificates for Credit MR 5: Documentation that products used have been extracted and manufactured regionally.
 - 4. Certificates for MR 7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include

evidence that mill is certified for chain of custody by an FSC-accredited certification body.

- a. Include statement indicating costs for each certified wood product.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of woodwork.
- B. Quality Standard: Unless otherwise indicated, comply with AWT's "Architectural Woodwork Quality Standards."
- C. Forest Certification: Provide interior architectural woodwork produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wood Products:
 1. Recycled Content of Medium-Density Fiberboard and Particleboard: Provide products with an average recycled content so postconsumer recycled content plus one-half of preconsumer recycled content is not less than **20%** percent.
 2. Hardboard: AHA A135.4.
 3. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 4. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
 5. Softwood Plywood: DOC PS 1, Medium Density Overlay.
 6. Veneer-Faced Panel Products (Hardwood Plywood) HPVA HP-1, made with adhesive containing no urea formaldehyde.
 7. Salvaged Wood - <WD-01>: Virgin Heart Sinker Cypress, LLC.
 - a. Species: Bald Cypress
 - b. Board Size: 9" by 108" by 1" thick, planed to ¾ inch thick.
 - c. Matte Finish Sealant
- B. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

- C. High-Pressure Decorative Laminate <PLAM>: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
- D. Solid-Surfacing Material <SSM-01>: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
 - 1. Basis of Design: Subject to compliance with requirements, provide Zodiaq by DuPont Company, or one of the following:
 - a. Avonite, Inc.
 - b. Formica Corporation.
 - c. Nevamar Company, LLC; Decorative Products Div.
 - d. Wilsonart International; Div. of Premark International, Inc.
 - 2. Color: Cloud White
 - 3. Thickness: 1 1/8 (horizontal installation) inch thick
 - 4. Edge Treatment: Square.
 - 5. Seam width: Less than 1/8 inch unless otherwise indicated on the Drawings.
- E. Solid-Surfacing Material <SSM-02>: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
 - 1. Basis of Design: Subject to compliance with requirements, provide Corian by DuPont Company, or one of the following:
 - a. Avonite, Inc.
 - b. Formica Corporation.
 - c. Nevamar Company, LLC; Decorative Products Div.
 - d. Wilsonart International; Div. of Premark International, Inc.
 - 2. Color: Dove.
 - 3. Thickness: 1/2 (industry standard installation) inch thick
 - 4. Edge Treatment: Square
- F. Decorative Metal <DTML-01>:
 - 1. Basis of Design: Forms + Surfaces, Stainless steel, Marquisette finish and Marquisette Eco-Etch Patterns
 - 2. Sheet thickness: 0.8 mm

2.2 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural woodwork, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.
- C. Pulls: Refer to drawings for manufacturer product number and sizes.

Drawer Slides: BHMA A156.9, B05091.

1. Standard Duty (Grade 1, Grade 2, and Grade 3): Side mounted full-extension type; epoxy-coated steel with polymer rollers.
2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.

D. Door Locks: BHMA A156.11, E07121.

E. Drawer Locks: BHMA A156.11, E07041.

F. 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.

G. Countertop Trash Chute: Stainless steel fabricated chute through countertop to waste container in base cabinet. All weld construction; satin stainless steel finish. Configuration as shown on Drawings.

2.3 FABRICATION

A. General: Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.

1. Interior Woodwork Grade: Premium .
2. Shop cut openings to maximum extent possible. Sand edges of cutouts to remove splinters and burrs. Seal edges of openings in countertops with a coat of varnish.

B. Interior Standing and Running Trim:

1. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

C. Plastic-Laminate Cabinets:

1. AWI Type of Cabinet Construction: Flush overlay .
2. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate as follows:
 - a. Horizontal Surfaces Other Than Tops: Grade HGL.
 - b. Postformed Surfaces: Grade HGP.
 - c. Vertical Surfaces: Grade VGS.
 - d. Edges: Grade VGS.
3. Materials for Semiexposed Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS
4. Drawer Sides and Backs: Thermoset decorative panels.
5. Drawer Bottoms: Thermoset decorative panels.
6. Colors, Patterns, and Finishes: As indicated on finish legend.

D. Plastic-Laminate Countertops:

1. High-Pressure Decorative Laminate Grade: HGS with Oyster Shield for horizontal surfaces.
2. Colors, Patterns, and Finishes: As indicated on Finish Legend.
3. Edge Treatment: As indicated on Drawings

E. Solid-Surfacing-Material Countertops:

1. Solid-Surfacing-Material Thickness: 3/4 inch.
2. Colors, Patterns, and Finishes: As indicated on finish legend.
3. Fabricate tops in one piece with loose backsplashes for field application. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
4. Install integral sink bowls in countertops in shop.

2.4 SHOP FINISHING

- A. Finish architectural woodwork at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.
- B. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas. Examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.
- B. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- C. Install woodwork level, plumb, true, and straight to a tolerance of 1/8 inch in 96 inches. Shim as required with concealed shims.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation.

1. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with toggle bolts through metal backing or metal framing behind wall finish.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop. Calk space between backsplash and wall with sealant specified in Section – 07 92 00 Joint Sealants.

END OF SECTION

SECTION 07 13 26 SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Modified bituminous sheet waterproofing
- B. Molded-sheet drainage panels.

1.2 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer.
- B. Single Source Responsibility:
 - 1. Waterproofing and Air Barrier portions of the building envelope have been designed utilizing a single source, these components shall be provided and warranted by a single source for building continuity. Contractor shall include other associated components not listed that are of critical nature to the integrity of the building envelope.
- C. Preinstallation Conference: Conduct conference at Project site.

1.4 WARRANTY

- A. Special Warranty for water-tightness: Five years.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: 60-mil- thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil- thick, polyethylene film with release liner on adhesive side and formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Basis of Design Product: The design for self-adhering sheet waterproofing is based on Bituthene 4000 by W.R. Grace & Co Construction Products.
2. Subject to compliance with requirements other manufacturers with products of products of equivalent design include:
 - a. Polyguard 650 Membrane, by Polyguard Products, Inc.
3. Physical Properties:
 - a. Tensile Strength: 250 psi minimum; ASTM D 412, Die C, modified.
 - b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
 - c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
 - d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
 - e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
 - f. Hydrostatic-Head Resistance: 150 feet minimum; ASTM D 5385.
 - g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
 - h. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.

2.2 AUXILIARY MATERIALS

- A. Primer: Liquid waterborne primer recommended for substrate by manufacturer of sheet waterproofing material.
- B. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.
- C. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.
- D. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.
- E. Protection Course: Molded-polystyrene board insulation, ASTM C 578, Type I, 0.90-lb/cu. ft. minimum density, 1-inch minimum thickness.

2.3 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 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 per ft.
 1. Basis of Design Product: Subject to compliance with requirements, the design for nonwoven-geotextile-faced, molded-sheet drainage panel is based on Hydroduct 220 by W.R. Grace & Co Construction Products

2. Subject to compliance with requirements other manufacturers with products of products of equivalent design include:
 - a. Polyflow 15, by Polyguard Products

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
- F. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
- G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.2 APPLICATION

- A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and according to recommendations in ASTM D 6135.
- B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.
- C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.
- D. Horizontal Application: Apply sheets from low point to high point of decks to ensure that side laps shed water.
- E. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.
- F. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic.

- G. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.
- H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.
- I. Install protection course with butted joints over waterproofing membrane immediately.
- J. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.3 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 adhesives that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.4 INSULATION INSTALLATION

- A. Install one or more layers of board insulation as protection course to achieve required thickness and insulation drainage panels over waterproofed surfaces in areas indicated on Drawings. Cut and fit to within 3/4 inch of projections and penetrations.
- B. On vertical surfaces, set insulation units in adhesive or tape applied according to manufacturer's written instructions.

3.5 PROTECTION AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Protect installed board insulation and drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Foam-plastic board insulation
- B. Glass-fiber blanket insulation
- C. Mineral-wool blanket insulation
- D. Spray Foam Insulation
- E. Vapor Retarder

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Including schedule indicating where each product is being used.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Product test reports.
- D. Research/Evaluation Reports: For foam-plastic insulation.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

- A. Underslab: Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 25 psi with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:
 - 1. Manufacturers:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company.
 - c. Owens Corning.
 - d. Pactiv Building Products Division.

- B. Exterior Wall Extruded-Polystyrene Board Insulation: ASTM C 578, Type X, 25 psi with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively to conform to IBC 2603.5

2.2 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 - 1. CertainTeed Corporation.
 - 2. Guardian Fiberglass, Inc.
 - 3. Johns Manville.
 - 4. Knauf Fiber Glass.
 - 5. Owens Corning.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- D. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
 - 1. 3-1/2 inches thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F
 - 2. 5-1/2 inches thick with a thermal resistance of 19 deg F x h x sq. ft./Btu at 75 deg F.

2.3 SPRAY POLYURETHANE FOAM INSULATION

- A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84, meeting the following criteria:
 - 1. Density in Place: 2.0 lb/cu ft.
 - 2. Compressive Strength: 25 psi nominal.
 - 3. Closed Cell Content: 90 percent, minimum.
 - 4. R-Value, Initial: R-13 at 2 inches nominal (6.4 per inch).
- B. Manufacturer: Subject to compliance with requirements, provide the following products:
 - 1. Manufacturer: NCFI; Division of Barnhardt Mfg. Co.; InsulStar® spray polyurethane foam insulation.

2.4 MINERAL-WOOL BLANKET INSULATION

- A. Manufacturers:
 - 1. Fibrex Insulations Inc.

2. Owens Corning.
 3. Thermafiber.
- B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.5 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- B. Ignition Barrier for Sprayfoam insulation in accordance with IBC 2603.4.
1. Provide intumescent ignition barrier over applications of spray polyurethane foam insulation.
 2. Product: NCFI: Division of Barnhardt Mfg Co.; Aldocoat 757.

2.6 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate formed from perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square, welded to projecting copper-coated steel spindle 0.105 inch in diameter and of length capable of holding insulation of thickness indicated securely in position with 1-1/2-inch- square or diameter self-locking washers complying with the following requirements:
1. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel sheet, with beveled edge for increased stiffness.
- B. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch between face of insulation and substrate to which anchor is attached.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

2.7 VAPOR RETARDERS

- A. Polyethylene Vapor Retarders: ASTM D 4397, 10 mils thick, with maximum permeance rating of 0.13 perm.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

PART 3 - EXECUTION**3.1 INSTALLATION, GENERAL**

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
- F. Protect top surface of horizontal insulation from damage during concrete work by applying protection course with joints butted.

3.2 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.3 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures.
 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- D. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
 2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- E. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.
1. Retain insulation in place by metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
 2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.
- F. Apply self-supported, spray-applied cellulosic insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it flush with face of studs by using method recommended by insulation manufacturer.
- G. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
- H. Stuff mineral-wool blanket insulation into miscellaneous voids and cavity spaces at top of rated walls.

3.4 FOAM INSULATION PREPARATION AND APPLICATION

- A. Comply with the instructions and recommendations of the foam insulation system manufacturer.
- B. Clean surfaces thoroughly prior to installation.
- C. Grout, tape, or caulk all joint openings that exceed 1/4 inch in width.
- D. Prime substrate as recommended by manufacturer.
- E. Do not apply foam during inclement weather or when the temperature or humidity is below that specified by the manufacturer for ambient air and substrate. Use wind barriers if wind conditions could affect the quality of installation.

END OF SECTION

SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fluid-applied membrane air barrier, vapor permeable.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Provide air barrier system to perform as a continuous barrier to air infiltration/exfiltration and to act as a liquid water drainage plane flashed to discharge any incidental condensation or water penetration.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and substrate preparation recommendations for each type of product indicated
- B. Shop Drawings: Show locations and extent of air and vapor barrier system, including details for terminations, connection with adjoining construction, and dissimilar materials, flashings, penetrations, window and door openings and treatment of substrate joints and cracks.
- C. Product certificates.
- D. Qualification data.
- E. Product test reports.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility:
 - 1. Waterproofing and Air Barrier portions of the building envelope have been designed utilizing a single source, these components shall be provided and warranted by a single source for building continuity. Contractor shall include other associated components not listed that are of critical nature to the integrity of the building envelope.
- B. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- C. Mockups: Before beginning installation of air barrier, build mockups of exterior wall assembly of 150 sq. ft., 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. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.
2. Include junction with roofing membrane, building corner condition, and foundation wall intersection.

D. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FLUID-APPLIED MEMBRANE AIR BARRIER

A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Two-part, self-curing, synthetic polymer, rubber-based membrane, free of solvents, isocyanates, and bitumen.

1. Basis of Design: Grace, W.R. & Co.; Perm-A-Barrier VP Liquid.
2. Subject to compliance with requirements products of equivalent design include:
 - a. Poly Wall AirLok flex VP by Polyguard Products Inc.
3. Physical and Performance Properties:
 - a. Membrane Air Permeance: Not to exceed 0.004 cfm/ sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
 - b. Membrane Vapor Permeance: Not less than 10 perms; ASTM E 96.

2.2 TRANSITION/DETAIL MEMBRANE

A. Transition Membrane: Self-adhesive rubberized asphalt integrally bonded to 4 mils of cross-laminated, high-density polyethylene film to provide a minimum 40 mils thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.

1. Product: Subject to compliance with requirements, provide products by one of the following:
 - a. Grace, W.R. & Co.;
 - b. Polyguard Products Inc.,
2. Physical and Performance Properties:
 - a. Water Vapor Transmission: ASTM E 96, Method B: 0.05 perms maximum.
 - b. Air Permeance at 75Pa (0.3 in. water) pressure difference: Not to exceed 0.00012 cfm/ft² maximum.
 - c. Puncture Resistance: ASTM E 154: 40 lbs. min.
 - d. Lap Adhesion at -4°C (25°F), ASTM D 1876: 5.0 lbs./in. of width min.
 - e. Low Temperature Flexibility, ASTM D 1970: Unaffected to -45°F.
 - f. Tensile Strength, ASTM D 412, Die C Modified: 400 psi.
 - g. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D 412 Die C: min. 200%

2.3 ALUMINUM FLASHING

- A. Aluminum faced transition and detail flashing for use at ACM panels
 - 1. Product: Subject to compliance with requirements, provide products by one of the following:
 - a. Grace, W.R. & Co.;
 - b. Polyguard Products Inc.,
 - 2. Physical Properties
 - a. Thickness: 0.040 inch minimum
 - b. Membrane Tensile Strength: 600 psi minimum per ASTM D412 die C modified
 - c. Aluminum Film Tensile Strength: 4000 psi, minimum per ASTM D412 die C modified
 - d. Minimum elongation, to failure of rubberized asphalt:200%, minimum per ASTM D412 die C modified
 - e. Water Absorption: 0.1% per ASTM D570

2.4 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by fluid-applied membrane 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 primer recommended for substrate by manufacturer of fluid-applied membrane air barrier material.
- C. Butyl Strip: Vapor-retarding, 30- to 40-mil- thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.
- D. Modified Bituminous Strip: Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.
- E. Joint Reinforcing Strip: Air barrier manufacturer's glass-fiber-mesh tape.
- F. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- G. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- H. Joint Sealants and Caulks: Use compatible joint sealants and caulks as recommended by fluid-applied membrane air barrier and aluminum flashing manufacturer.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - 2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
 - 3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 4. Verify that masonry joints are flush and completely filled with mortar.
 - 5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

- A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.
 - 1. Prime substrate and apply a single thickness of preparation coat strip extending a minimum of 3 inches along each side of joint and cracks. Apply a double thickness of air barrier membrane and embed a joint reinforcing strip in preparation coat.

- B. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and with air barrier manufacturer's written instructions. Apply first layer of fluid air barrier membrane at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air barrier membrane over joint reinforcing strip.

3.4 TRANSITION MEMBRANE AND STRIP INSTALLATION

- A. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
 - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - 2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over both substrates.
- B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.
 - 1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Connect and seal exterior wall air barrier membrane 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.
- D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- E. 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.
- F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply adhesive-coated transition strip so that a minimum of 3 inches of coverage is achieved over both substrates. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.
 - 1. Adhesive-Coated Transition Strip: Roll firmly to enhance adhesion.
 - 2. Elastomeric Flashing Sheet: Apply adhesive to wall, frame, and flashing sheet. Install flashing sheet and termination bars, fastened at 6 inches o.c. Apply lap sealant over exposed edges and on cavity side of flashing sheet.
 - 3. Preformed Silicone-Sealant Extrusion: Set in full bed of silicone sealant applied to walls, frame, and membrane.
- G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

- H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- I. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, modified bituminous strip.
- J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.
- L. Aluminum Flashing: Install in accordance with manufacturer recommendations at locations where zee members are used to attach ACM panels to studs. Protect dissimilar metal members from contact between aluminum flashing and steel framing members.

3.5 AIR BARRIER MEMBRANE INSTALLATION

- A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.
- B. 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.
- C. Apply air barrier membrane within manufacturer's recommended application temperature ranges.
- D. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.
 - 1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- E. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.
 - 1. Vapor-Permeable Membrane Air Barrier: 47-mil minimum dry film thickness.
- F. Apply strip and transition strip a minimum of 1 inch onto cured air membrane or strip and transition strip over cured air membrane overlapping 3 inches onto each surface according to air barrier manufacturer's written instructions.
- G. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.
- H. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 - 1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
 - 2. Continuous structural support of air barrier system has been provided.
 - 3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
 - 4. Site conditions for application temperature and dryness of substrates have been maintained.
 - 5. Maximum exposure time of materials to UV deterioration has not been exceeded.
 - 6. Surfaces have been primed, if applicable.
 - 7. Laps in 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.
 - 8. Termination mastic has been applied on cut edges.
 - 9. Strips and transition strips have been firmly adhered to substrate.
 - 10. Compatible materials have been used.
 - 11. Transitions at changes in direction and structural support at gaps have been provided.
 - 12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
 - 13. All penetrations have been sealed.
- C. Remove and replace deficient air barrier components and retest as specified above.

3.7 PROTECTION

- A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
 - 1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 60 days.

END OF SECTION

SECTION 07 41 13 - METAL ROOF PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Standing-seam metal roof panels.

1.2 PREINSTALLATION MEETINGS

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

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Product Test Reports for Credit SS 7.2: For roofing materials, documentation indicating that roofing materials comply with Solar Reflectance Index requirement.
- C. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- D. Samples: For each type of metal panel indicated.
- E. Product test reports.
- F. Warranties: Sample of special warranties.
- G. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Solar Reflectance Index: Not less than 78 according to ASTM E 1980.
- C. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for low-slope roof products.
- D. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- E. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.
- F. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Windstorm Classification: Class FM 1-120.
 - 2. Hail Resistance: MH
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F , ambient; 180 deg F, material surfaces.

2.2 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide AEP Span's "Span-Lok" panels or comparable product by one of the following:
 - a. CENTRIA Architectural Systems.
 - b. Firestone Metal Products, LLC.
 - c. MBCI; a division of NCI Building Systems, L.P.
 - d. Metal Sales Manufacturing Corporation.
 - e. Morin; a Kingspan Group company.
 - 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 0.028 inch.
 - b. Exterior Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 - 3. Clips: One-piece to accommodate thermal movement.
 - a. Material: Nominal 0.028-inch hook with 0.064-inch base, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
 - 4. Joint Type: Single folded.
 - 5. Panel Coverage: 12 inches.
 - 6. Panel Height: 2.0 inches.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 - 2. 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- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Gutters and Downspouts: Formed from same material as roof panels according to SMACNA's "Architectural Sheet Metal Manual." Finish to match metal roof panels.
- E. Panel Fasteners: Self-tapping screws designed to withstand design loads.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.5 FINISHES

- A. Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.

- a. Color: Custom color as selected by Architect.
2. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.2 METAL PANEL INSTALLATION

- A. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
 1. Install clips to supports with self-tapping fasteners.
 2. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
 3. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.
- B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.3 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION

SECTION 07 42 10 - PERFORATED METAL SCREEN WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Metal Screen Wall Assembly

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation layouts of perforated metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, and accessories; and special details.
- C. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
- D. Samples: For each type of exposed finish required.

1.3 QUALITY ASSURANCE

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

1.4 WARRANTY

- A. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace perforated metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis-of-Design Product: CENTRIA Architectural Systems; EcoScreen Perforated Screen Wall or comparable product by one of the following:

- a. AMETCO
- b. Corrugated Metal
- c. ATAS

2.2 PERFORATED METAL WALL PANELS

- A. Metal Wall Panels: Factory-formed panels with interconnecting side joints, fastened to supports with exposed fasteners.
- B. Panel Profile: Symmetrical rib profile with lap joint
 - 1. Basis of Design: CENTRIA, Style-Rib
 - 2. Panel Coverage: 36 inches
 - 3. Panel Depth 1-1/2 inches
 - 4. Rib Spacing: 5 at 7.2 inches oc
- C. Panel Pattern: Staggered pattern, 3/8 inch perforations at 9/16 inch spacing with 40 percent open area.
- D. Finish: Two-coat Mica System: 0.20-mil primer with 0.8-mil 70 percent PVDF fluoropolymer color coat providing a pearlescent appearance, AAMA 620 - both sides of panels
 - 1. Basis of Design: CENTRIA Sundance Mica
 - 2. Color: 9946 Silversmith.

2.3 MISCELLANEOUS MATERIALS

- A. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

2.4 FABRICATION

- A. General: Fabricate and finish perforated metal wall panels and accessories at the factory, by manufacturer's standard procedures and processes.

PART 3 - EXECUTION

3.1 PERFORATED METAL SCREEN WALL PANEL INSTALLATION

- A. Attachment Assembly, General: Install attachment assembly required to support perforated metal wall panels and associated signage.
- B. Coat concealed surfaces of perforated metal screen wall panels that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

- C. Installation: Attach perforated metal wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer.

3.2 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as perforated metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, clean finished surfaces as recommended by perforated metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION

SECTION 07 42 13 - METAL COMPOSITE MATERIAL WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Metal composite material wall panels.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- 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; recess light locations and special details. Distinguish among factory-, shop-, and field-assembled work.
- C. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
- D. Samples: For each type of exposed finish required.
- E. Delegated-Design Submittal: For metal-faced composite wall panel assembly indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Product test reports.
- G. Maintenance data.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Preinstallation Conference: Conduct conference at Project site.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite material panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal-faced composite wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Metal wall panel assemblies shall withstand the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:
 - 1. Deflection Limits: Metal wall panel assemblies shall withstand wind loads with horizontal deflections no greater than
 - a. Maximum allowable deflection limited to L/175 deflection of panel head and sill normal to plane of wall.
 - b. Maximum allowable deflection of panel stiffeners and aluminum panel material combined limited to L/60.

2.2 METAL COMPOSITE MATERIAL WALL PANELS

- A. Metal Composite Material Wall Panel Systems: Provide factory-formed and -assembled, metal composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assemblies, components, panel stiffeners, and accessories required for weathertight system.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide CENTRIA Architectural Systems; Formabond II Wall System or comparable product by one of the following:
 - a. 3A Composites USA Inc.; Alucobond.

- b. Alcoa Inc.; Reynobond PE.
 - c. ALPOLIC, Division of Mitsubishi Chemical America, Inc.; ALPOLIC PE
- B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- thick, coil-coated aluminum sheet facings.
 - 1. Panel Thickness: 0.157 inch. (4mm)
 - 2. Core: Standard.
 - 3. Exterior Finish: Two-coat fluoropolymer.
 - a. Color (MTL-01): Centria 971 Chromium Gray.
 - b. Color (MTL-02): Centria 181 Slate Gray.
- C. Attachment Assembly Components: Formed from extruded aluminum.
- D. Attachment Assembly: Manufacturer's standard.

2.3 MISCELLANEOUS MATERIALS

- A. Aluminum Extrusions: ASTM B 221.
- B. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal composite material panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

2.4 FABRICATION

- A. General: Fabricate and finish metal composite material panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate metal composite material panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

2.5 FINISHES

- A. Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal composite material panel manufacturer's written recommendations.

3.2 METAL COMPOSITE MATERIAL PANEL INSTALLATION

- A. Attachment Assembly, General: Install attachment assembly required to support metal composite material 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.
- B. Installation: Attach metal composite material wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.
 - 1. Rainscreen Systems: Do not apply sealants to joints unless otherwise indicated.
- C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

3.3 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal composite material panel installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION

SECTION 07 54 23 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Adhered TPO membrane roofing system.

1.2 PERFORMANCE REQUIREMENTS

- A. Energy Performance: Provide roofing system with initial Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
- B. Wind Uplift Rating : Field 120 psf

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit SS 7.2: For roof materials, indicating that roof materials comply with Solar Reflectance Index requirement.
 - 2. Product Data for Credit IEQ 4.1: For adhesives and sealants, including printed statement of VOC content.
- C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work. Show all roof penetrations, drains, crickets plans and all roof mounted equipment.
- D. Samples for Verification: For the following products:
 - 1. Sheet roofing, of color specified.
- E. 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.
- F. Research/evaluation reports.
- G. Field quality-control reports.
- H. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product.
- B. Source Limitations: Obtain components including roof insulation, fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.
- C. 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.
- D. FM Approvals: Roof Assembly shall conform to the materials and assembly as design by RoofNav assembly numbers shown on Drawings and with a Windstorm Resistance Classification of FM 1-120
- E. Preinstallation Roofing Conference: Conduct conference at Project site.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system 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 TPO MEMBRANE ROOFING**

- A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible TPO sheet.
 - 1. Basis of Design: Firestone UltraPly TPO
 - 2. Manufacturers: Subject to compliance with requirements, other manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle SynTec Incorporated.
 - b. EverGuard Roofing by GAF
 - c. Johns Manville.
 - d. Stevens Roofing Systems; Division of JPS Elastomerics.
 - e. Versico Incorporated.
 - 3. Thickness: 60 mils, nominal.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

- A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
 - 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.
 - d. Fiberglass Adhesives: 80 g/L.
 - e. Contact Adhesive: 80 g/L.
 - f. Other Adhesives: 250 g/L.
 - g. Single-Ply Roof Membrane Sealants: 450 g/L.
 - h. Nonmembrane Roof Sealants: 300 g/L.
 - i. Sealant Primers for Nonporous Substrates: 250 g/L.
 - j. Sealant Primers for Porous Substrates: 775 g/L.
- B. Sheet Flashing: Manufacturer's enhanced thermoplastic polyolefin sheet flashing, 55 mils
- C. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.3 ROOF INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.6-lb/cu. ft. minimum density, square edged.
- B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/2 inch per 12 inches unless otherwise indicated.
- C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.4 INSULATION ACCESSORIES

- A. Insulation Adhesive: Insulation manufacturer's recommended cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

2.5 ASPHALT MATERIALS

- A. Roofing Asphalt: ASTM D 312, Type III or Type IV.
- B. Asphalt Primer: ASTM D 41.

PART 3 - EXECUTION**3.1 INSULATION INSTALLATION**

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- E. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
 - 1. Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft. and allow primer to dry.
 - 2. Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
 - 3. Set each layer of insulation in adhesive, firmly pressing and maintaining insulation in place.
- F. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure 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 to resist uplift pressure at corners, perimeter, and field of roof.
 - 2. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
 - 3. Set each subsequent layer of insulation in adhesive, firmly pressing and maintaining insulation in place.
- G. 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.
 - 1. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.
- H. Install slip sheet over insulation and immediately beneath membrane roofing.

3.2 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.
- B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

- C. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.
- D. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.
- E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
- F. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

3.3 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

END OF SECTION

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Formed low-slope roof sheet metal fabrications.
- B. Formed wall sheet metal fabrications.

1.2 PREINSTALLATION MEETINGS

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

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Distinguish between shop- and field-assembled work.
 - 3. Include identification of finish for each item.
 - 4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.
- D. Samples: For each exposed product and for each color and texture specified.

1.4 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 SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

1.5 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. 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 SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 - 1. Design Pressure: Per IBC 1504.5, and as indicated on Structural Drawings
- D. Recycled Content of Steel-Sheet Flashing and Trim: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, 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. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
 - 1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Color: match Architect's sample
- C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 1. 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.
 2. Color: Match Architect's sample

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.-Conn.; Grace Ice and Water Shield HT.
 - c. Henry Company; Blueskin PE200 HT.
 2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
 3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
- C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. 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 unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

- a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 3. 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 Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead
- 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 wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane 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. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- I. 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. Obtain field measurements for accurate fit before shop fabrication.
 2. 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.
 3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

- B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- C. 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.
- D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- E. 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.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use..

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Copings: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, fasten and seal watertight.
 - 1. Fabricate from the Following Materials:
 - a. Aluminum: 0.050 inch thick.
 - b. Galvanized Steel: 0.040 inch thick.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

- A. Prior to installation confirm compatibility of weather barrier, roofing, underlayment and other materials. Protect dissimilar materials as recommended by manufacturer.
- B. 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.
- C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, 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 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.
- 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 sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate 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. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 - Joint Sealants.

3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and 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. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.

3.4 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.

END OF SECTION

SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Roof hatches.

1.2 SUBMITTALS

- A. Product Data: For each type of roof accessory indicated.
- B. Shop Drawings: Show fabrication and installation details for roof accessories.
- C. Samples: For each type of exposed factory-applied color finish required and for each type of roof accessory indicated, prepared on Samples of size to adequately show color.

1.3 QUALITY ASSURANCE

- A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

- A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and finish. Coil-coat finish as follows:
 - 1. Baked-Enamel Finish: Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 1.5 mils, medium gloss.
 - a. Color and Gloss: White
- B. Stainless-Steel Shapes or Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304 or Type 316, No. 2D finish.

2.2 ROOF HATCHES

- A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated **double-wall** curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous

weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.

1. Manufacturers:
 - a. Babcock-Davis; a Cierra Products Inc. Company.
 - b. Bilco Company (The).
 - c. Custom Curb, Inc.
 - d. J. L. Industries, Inc.
 - e. Milcor Inc.; a Gibraltar Company.
 - f. Nystrom, Inc.
 - g. O'Keeffe's Inc.
2. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loads.
3. Type and Size: Single-leaf lid, 30 by 36 inches.
4. Curb and Lid Material: Aluminum sheet, 0.090 inch.
5. Insulation: Polyisocyanurate board.
6. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
7. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
8. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
9. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
10. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
11. Ladder Safety Post: Manufacturer's standard ladder safety post. Post to lock in place on full extension. Provide release mechanism to return post to closed position.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install roof accessories to fit substrates and to result in watertight performance.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
 3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.
- D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
- E. Seal joints with butyl sealant as required by manufacturer of roof accessories.

END OF SECTION

SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814
 - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
 - 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - a. Penetrations located outside wall cavities.
 - b. Penetrations located outside fire-resistance-rated shaft enclosures.
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 - 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop 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.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item.
 - 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- C. Qualification Data: For Installer.

1.4 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 in Project to a single qualified insaller.
- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, OPL ITS, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems bearing classification marking of qualified testing and inspecting agency.
- D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- E. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

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. A/D Fire Protection Systems Inc.
 - 2. Grace, W. R. & Co. - Conn.
 - 3. Hilti, Inc.
 - 4. Johns Manville.
 - 5. Nelson Firestop Products.
 - 6. NUCO Inc.
 - 7. RectorSeal Corporation (The).
 - 8. Specified Technologies Inc.
 - 9. 3M; Fire Protection Products Division.
 - 10. Tremco; Sealant/Weatherproofing Division.
 - 11. USG Corporation.

2.2 FIRESTOPPING

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- D. Identification: Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. Include the following information on labels:
1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Through-penetration firestop system manufacturer's name.
 6. Installer's name.

3.2 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage an independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Silicone joint sealants.
- B. Urethane joint sealants.
- C. Latex joint sealants.
- D. Preformed joint sealants.
- E. Acoustical joint sealants.

1.2 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers eight samples of materials that will contact or affect joint sealants. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each kind and color of joint sealant required.
- C. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designations, keyed to drawings.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.
- D. Product test reports.
- E. Preconstruction compatibility and adhesion test reports.
- F. Preconstruction field-adhesion test reports.

G. Field-adhesion test reports.

H. Warranties.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

B. Provide products required by Mock-up as indicated in Section 01 40 00 – Quality Assurance.

C. Preinstallation Conference: Conduct conference at Project site.

1.5 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which 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's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period – Silicone Sealants: 20 years from date of Substantial Completion.

2. Warranty Period all other sealants: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.

2. Sealant Primers for Nonporous Substrates: 250 g/L.

3. Sealant Primers for Porous Substrates: 775 g/L.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone

testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

- C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.2 SILICONE SEALANTS

- A. Neutral-Curing Silicone Joint Sealant: ASTM C 920.
 - 1. Basis of Design Tremco Incorporated “Spectrem 2 Silicone”. Other manufacturers subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. Pecora Corporation.
 - c. Sika Corporation; Construction Products Division.
 - 2. Type: Single component (S) or multicomponent (M).
 - 3. Grade: Nonsag (NS).
 - 4. Class: 50.
 - 5. Uses Related to Exposure: Nontraffic (NT).

2.3 URETHANE JOINT SEALANTS

- A. Urethane Joint Sealant: ASTM C 920.
 - 1. Basis of Design Tremco Incorporated “Vulkem 116 or 227”. Other manufacturers subject to compliance with requirements, provide products by one of the following:
 - a. BASF Building Systems.
 - b. Bostik, Inc.
 - c. Lyntal, International, Inc.
 - d. Pecora Corporation.
 - e. Sika Corporation; Construction Products Division.
 - 2. Type: Single component (S) or multicomponent (M).
 - 3. Grade: Nonsag (NS).
 - 4. Class: 100/50.
 - 5. Uses Related to Exposure: Non-Traffic (NT).
- B. Polyurethane Joint Sealant: ASTM C 920.
 - 1. Basis of Design Tremco Incorporated “Vulkem 202”. Other manufacturers subject to compliance with requirements, provide products by one of the following:

- a. BASF Building Systems.
 - b. Bostik, Inc.
 - c. Lyntal, International, Inc.
 - d. Pecora Corporation.
 - e. Sika Corporation; Construction Products Division.
2. Type: Multicomponent (M).
 3. Federal Specification SS-S-200E, Type H.
 4. Uses Related to Exposure: Traffic (T).

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: ASTM C 834.

1. Basis of Design Tremco Incorporated "Tremflex 834". Other manufacturers subject to compliance with requirements, provide products by one of the following:
 - a. BASF Building Systems.
 - b. Bostik, Inc.
 - c. May National Associates, Inc.
 - d. Pecora Corporation.
 - e. Schnee-Morehead, Inc.
2. Type: Single component (S).
3. Grade: NF.
4. Uses Related to Exposure: Non-Traffic (NT).

2.5 PREFORMED JOINT SEALANTS

A. Preformed Foam Joint Sealant : Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dayton Superior Specialty Chemicals.
 - b. EMSEAL Joint Systems, Ltd.
 - c. Sandell Manufacturing Co.

2.6 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Pecora Corporation.
- b. USG Corporation.

2.7 JOINT SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
 1. Remove laitance and form-release agents from concrete.
 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or

by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. 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.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. 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.
- E. 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.
- F. Acoustical Sealant Installation: Comply with ASTM C 919 and with manufacturer's written recommendations.
- G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 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 of joint length for each kind of sealant and joint substrate.
 - b. Perform 1 test for each 1000 feet of joint length thereafter or 1 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.
- 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.

3.4 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces nontraffic surfaces.
 - 1. Joint Locations:
 - a. Joints in butt-glazed curtain wall.
 - 2. Joint Sealant: Silicone.
 - 3. Joint-Sealant Color: Black or Gray to be selected by Architect as part of Mock-up. Refer to Mock-up drawings
- B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Isolation and contraction joints in concrete paving.
 - 2. Joint Sealant: Polyurethane.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. 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 storefront/curtain wall and other building materials.
 - c. Joints between metal panels.
 - d. Joints between different materials listed above.

- e. Perimeter joints between materials listed above and frames of doors, storefront, curtain wall and louvers.
- 2. Joint Sealant: Urethane.
- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. 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. Joint Sealant: Urethane.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. 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. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
 - d. Other joints as indicated.
 - 2. Joint Sealant: Latex.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. 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: Latex.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- G. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Location: Acoustical joints where indicated.
 - 2. Joint Sealant: Acoustical.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Standard hollow metal doors and frames.

1.2 SUBMITTALS

- A. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.
- C. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

1.3 QUALITY ASSURANCE

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.
- B. Wind Load Requirements: 130 mph exposure C, ASCE 7
- C. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Amweld Building Products, LLC.
 - 2. Benchmark; a division of Therma-Tru Corporation.
 - 3. Ceco Door Products; an Assa Abloy Group company.
 - 4. Curries Company; an Assa Abloy Group company.
 - 5. Mesker Door Inc.
 - 6. Pioneer Industries, Inc.

7. Steelcraft; an Ingersoll-Rand company.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, CS, Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, CS, Type B.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- G. Mineral-Fiber Insulation: ASTM C 665, Type I.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Comply with ANSI/SDI A250.8.
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 - a. Fire Door Core: As required to provide fire-protection ratings indicated.
 - b. Thermal-Rated (Insulated) Doors: R-value of not less than 12.3 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
 - 3. Vertical Edges for Single-Acting Doors: Square edge.
 - 4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
 - 5. Tolerances: SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Comply with ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush).
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 1. Level 1 and Physical Performance Level C (Standard Duty), Model 1 (Full Flush).
 - a. Width: As indicated on Drawings.
- D. Hardware Reinforcement: ANSI/SDI A250.6.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
 1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as full profile welded unless otherwise indicated.
 3. Frames for Level 1 Steel Doors: 0.042-inch- thick steel sheet.
 4. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet.
 1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as full profile welded unless otherwise indicated.
 3. Frames for Level 1 Steel Doors: 0.042-inch- thick steel sheet.
 4. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.
 5. Frames for Wood Doors: 0.053-inch thick steel sheet.
- D. Hardware Reinforcement: ANSI/SDI A250.6.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- wide steel.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.7 FABRICATION

- A. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- B. Hollow Metal Doors:
 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors. Seal joints in top edges of doors against water penetration.
- C. Hollow Metal Frames: Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.

- 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
- c. Compression Type: Not less than two anchors in each jamb.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
- 6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers.
 - a. Single-Door Frames: Three door silencers.
 - b. Double-Door Frames: Two door silencers.
- D. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware according to the Door Hardware Schedule and templates furnished as specified in Section 08 71 00 - Door Hardware.
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 electrical Sections.

2.8 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - 1. Shop Primer: ANSI/SDI A250.10.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hollow Metal Frames: Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.

- b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install door silencers in frames before grouting.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - f. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
 6. 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.
 7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
 9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- B. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

- a. Jams and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

3.2 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. 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.
- C. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Solid-core doors with wood-veneer faces.
- B. Factory finishing flush wood doors.
- C. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 SUBMITTALS

- A. Product Data: For each type of door indicated. Include factory-finishing specifications.
- B. LEED Submittals:
 - 1. Certificates for Credit MR 7: Chain-of-custody certificates certifying that flush wood doors comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
 - a. Include statement indicating costs for each certified wood product.
 - 2. Product Data for Credit IEQ 4.4: For adhesives and composite wood products, documentation indicating that product contains no urea formaldehyde.
- C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate requirements for veneer matching.
 - 3. Indicate doors to be factory finished and finish requirements.
 - 4. Indicate fire-protection ratings for fire-rated doors.
- D. Samples: For factory-finished doors.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."

- C. Forest Certification: Provide doors made with not less than 70 percent of wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Algoma Hardwoods, Inc.
 - 2. Chappell Door Co.
 - 3. Eagle Plywood & Door Manufacturing, Inc.
 - 4. Eggers Industries.
 - 5. Graham; an Assa Abloy Group company.
 - 6. Lambton Doors.
 - 7. Marshfield Door Systems, Inc.
 - 8. Mohawk Flush Doors, Inc.; a Masonite company.
 - 9. Oshkosh Architectural Door Company.
 - 10. Poncraft Door Company.
 - 11. Vancouver Door Company.
 - 12. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. Particleboard-Core Doors:
 - 1. Particleboard: ANSI A208.1, Grade LD-1 , made with binder containing no urea-formaldehyde resin.
 - 2. Provide doors with either glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.
- C. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 - 1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 - 2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade AA faces.
2. Species: Select white maple.
3. Cut: Quarter Sawn.
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.
7. Core: Particleboard.
8. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.

2.4 FABRICATION

- ### **A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.**
1. Comply with requirements in NFPA 80 for fire-rated doors.
- ### **B. Factory machine doors for hardware that is not surface applied.**

2.5 FACTORY FINISHING

- ### **A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.**
1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- ### **B. Finish doors at factory that are indicated to receive transparent finish. Field finish doors indicated to receive opaque finish.**
- ### **C. Transparent Finish:**
1. Grade: Premium.
 2. Finish: AWI catalyzed polyurethane system.
 3. Staining: Custom to match Architect's sample.
 4. Effect: Filled finish
 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION

- ### **A. Hardware: For installation, see Section 08 71 00 - Door Hardware.**

- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
- 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.

END OF SECTION

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Access doors and frames for walls and ceilings.

1.2 SUBMITTALS

- A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- B. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.3 QUALITY ASSURANCE

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. UL 10B for vertical access doors and frames.
 - 2. UL 263 for horizontal access doors and frames.

1.4 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Factory-Primed Finish: Manufacturer's standard shop primer.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Acudor Products, Inc.
 2. Babcock-Davis; A Cierra Products Co.
 3. Bar-Co, Inc. Div.; Alfab, Inc.
 4. J. L. Industries, Inc.
 5. Karp Associates, Inc.
 6. Larsen's Manufacturing Company.
 7. MIFAB, Inc.
 8. Milcor Inc.
 9. Nystrom, Inc.
- B. Recessed Access Doors and Trimless Frames: Fabricated from metallic-coated steel sheet.
1. Locations: Wall and ceiling surfaces.
 2. Door: Minimum 0.060-inch- thick sheet metal in the form of a pan recessed 5/8 inch for gypsum board infill.
 3. Frame: Minimum 0.060-inch- thick sheet metal with drywall bead.
 4. Hinges: Spring-loaded, concealed-pin type.
 5. Latch: Cam latch with interior release.
- C. Fire-Rated, Insulated, Flush Access Doors and Trimless Frames: Fabricated from steel sheet.
1. Locations: Wall and ceiling surfaces.
 2. Fire-Resistance Rating: Not less than that of adjacent construction.
 3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
 4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
 5. Frame: Minimum 0.060-inch-thick sheet metal with drywall bead.
 6. Hinges: Continuous piano.
 7. Automatic Closer: Spring type.
 8. Latch: Self-latching device operated by flush key with interior release.

2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view, provide materials with smooth, flat surfaces without blemishes.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 08 33 23 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Service doors.
- B. Insulated service doors.

1.2 PERFORMANCE REQUIREMENTS

- A. 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: As indicated on Drawings.

1.3 SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory.
- 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. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Maintenance Data.

1.4 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. 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.

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. Insulation: Fill slats for insulated 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.
 - 2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
- B. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from metal to match curtain slats and finish.
- C. 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.
- D. 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.

2.2 HOOD

- 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. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

2.3 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: Provide cylinders standard with manufacturer and keyed to building keying system.
 - 2. Keys: Provide two for each cylinder.

- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.4 CURTAIN ACCESSORIES

- A. Weatherseals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.

2.5 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. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.6 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door 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. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 11 Section "Common Motor Requirements for Equipment" unless otherwise indicated.
 - 1. Electrical Characteristics:
 - a. Phase: Single phase.
 - b. Volts: 115 V.
 - 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. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
- D. 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. 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.
- E. Control Station: Constant Pressure contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- F. 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.
- G. 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.
- H. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.7 FIRE DOOR CONTROL

- A. Self-closing Mechanism: The acoustical fire door is to be designed with a centrifugal governor as an integral part of the operator's construction. The automatic release mechanism shall be activated by a fusible link, smoke detector or fire alarm. When activated the door is released and begins to close due to gravitational force. The speed of the door is governed by a centrifugal governor at a rate of not greater than 9-inches per second or less than 6-inches per second.
- B. Magnetic Release with 10 Second Time Delay: A fail-safe magnetic release device shall be built into the operator as an integral part of the release mechanism. When power is interrupted to the release mechanism by the smoke detector or fire alarm, the door shall begin to self-close. In the event of power failure the time delay shall prevent the acoustical fire door from closing for a period of 10 second. Once the 10 seconds have lapsed, the acoustical fire door shall self-close.
- C. Easy Trip Test Feature: The acoustical fire door shall be designed so that it may be trip-tested simply by cutting the power to the door. By turning off the power, the door shall self-

close. Once the acoustical fire door has satisfactorily closed, it shall be simply reset by turning the power back on. No ladders or tools shall be needed to reset the door or the magnetic release mechanism.

2.8 FIRE RATED ACOUSTICAL DOOR ASSEMBLIES

- A. Door 138A - Basis of Design: FSFD 3/4 hour by McKeon Door Overhead coiling door formed with curtain of interlocking metal slats.
 - 1. Subject to compliance with requirements, other manufacturers with products of equivalent design.
 - a. Cookson Company.
 - b. Cornell Iron Works, Inc.
 - c. Overhead Door Corporation.
- B. Operation Cycles: Not less than 50,000.
- C. Door Curtain Material: Steel.
- D. Door Curtain Slats: Flat profile slats of 3-1/4-inch center-to-center height.
- E. Acoustical Performance: STC 34, Minimum
- F. Curtain Jamb Guides: Manufacturer's standard 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: Between jambs.
- H. Locking Devices: Equip door with cylinder locks on bottom bar.
- I. Electric Door Operator:
 - 1. Usage Classification: Standard duty, up to 60 cycles per hour.
 - 2. Motor Exposure: Interior.
 - 3. Emergency Manual Operation: Chain type.
 - 4. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar .
 - 5. Remote-Control Station: Interior.
 - 6. Other Equipment: Audible and visual signals.
- J. Door Finish: Custom color, powder-coated as selected by Architect from manufacturer's full range.

2.9 INSULATED DOOR ASSEMBLY

- A. Basis of Design: McKeon Door IS3020

1. Exterior Door 137A
2. Interior Doors: 137C and 138 C
3. Subject to compliance with requirements, manufacturer with products of equivalent design include:
 - a. Cookson Company.
 - b. Cornell Iron Works, Inc.
 - c. Overhead Door Corporation.
- B. Operation Cycles: Not less than 50,000.
- C. Curtain R-Value: 5.0 deg F x h x sq. ft./Btu. Minimum R= 8.5
- D. Door Curtain Material: Galvanized steel.
- E. Door Curtain Slats: Flat profile slats of 3-1/4-inch center-to-center height.
 1. Insulated-Slat Interior Facing: Metal.
- F. Curtain Jamb Guides: 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: Round.
 2. Mounting: Face of wall.
 3. Motor Exposure: NEMA 1 for interior, NEMA 4 for exterior applications
 4. Emergency Manual Operation: Chain type.
 5. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar .
 6. Remote-Control Station: Interior.
- H. Door Finish:
 1. Finish: Custom color, powder-coated as selected by Architect from manufacturer's full range

PART 3 - EXECUTION

3.1 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. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion. Lubricate bearings and sliding parts as recommended by manufacturer. Adjust seals to provide weathertight fit around entire perimeter.

3.2 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

SECTION 08 33 26 - OVERHEAD COILING GRILLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Open-curtain overhead coiling grilles.

1.2 SUBMITTALS

- A. Product Data: For each type and size of overhead coiling grille and accessory.
- 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. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Maintenance data.

1.3 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. 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.

PART 2 - PRODUCTS

2.1 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

- A. Open-Curtain Grilles: Fabricate metal grille curtain as an open network of horizontal rods, spaced at regular intervals, that are interconnected with vertical links, which are formed and spaced as indicated and are free to rotate on the rods.
- B. Bottom Bar: Manufacturer's standard tubular shape, finished to match grille.
 - 1. Astragal: Equip each grille bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

2. Provide motor-operated grilles with combination bottom astragal and sensor edge.
- C. Grille Curtain Jamb Guides: Manufacturer's standard shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent overtravel of curtain.

2.2 ACCESSORIES

- A. Mounting Frame: Manufacturer's standard mounting frame designed to support grille; factory fabricated from ASTM A 36/A 36M structural-steel tubes or shapes; fastened to floor and structure above grille; to be built into wall construction; and complete with anchors, connections, and fasteners.

2.3 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: Provide cylinders standard with manufacturer and keyed to building keying system.
 2. Keys: Two for each cylinder.
- B. Safety Interlock Switch: Equip power-operated grilles with safety interlock switch to disengage power supply when grille is locked.

2.4 COUNTERBALANCING MECHANISM

- A. General: Counterbalance grilles by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Brackets: Manufacturer's standard mounting brackets, minimum 3/16 inch hot rolled steel plate.

2.5 ELECTRIC GRILLE OPERATORS

- A. General: Electric grille operator assembly of size and capacity recommended and provided by grille manufacturer for grille 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 grille, 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 grille.
- C. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 11 Section "Common Motor Requirements for Equipment" unless otherwise indicated.
 - 1. Electrical Characteristics:
 - a. Phase: Single phase
 - b. Volts: 115 V.
 - 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 grille in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
 - 4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
- D. Obstruction Detection Device: Equip motorized grille with indicated external automatic safety sensor capable of protecting full width of grille opening. Activation of sensor immediately stops and reverses downward grille travel.
 - 1. 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
- E. Control Station: Constant Pressure Contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop"; interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- F. Emergency Manual Operation: Equip each electrically powered grille with capability for emergency manual operation. Design manual mechanism so required force for grille operation does not exceed 25 lbf
- G. 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.
- H. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.6 OPEN-CURTAIN GRILLE ASSEMBLY

- A. Open-Curtain Grille: Overhead coiling grille with a curtain having a network of horizontal rods that interconnect with vertical links.
 - 1. Basis-of-Design Product: McKeon Door Company SG3000 with SL9 grille pattern
 - 2. Subject to compliance with requirements, provide products by or comparable product by one of the following:
 - a. Cookson Company.
 - b. Cornell Iron Works, Inc.
 - c. Overhead Door Corporation.
- B. Operation Cycles: Not less than 50,000.
- C. Grille Curtain Material: Aluminum, clear anodized finish
 - 1. Space rods at approximately 2 inches o.c.
 - 2. Space links approximately 9 inches apart in a straight in-line pattern.
 - 3. Spacers: Metal tubes matching curtain material.
- D. Curtain Jamb Guides: Aluminum with clear anodized finish matching curtain rods and links. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- E. Locking Devices: Equip grille with locking device assembly.
 - 1. Locking Device Assembly: Single-jamb side outside only, with cylinder.
- F. Electric Grille Operator:
 - 1. Usage Classification: Standard duty, up to 60 cycles per hour
 - 2. Emergency Manual Operation: Chain type.
 - 3. Remote-Control Station: Where shown on Drawings .

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install overhead coiling grilles and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Adjust hardware and moving parts to function smoothly so that grilles operate easily, free of warp, twist, or distortion. Lubricate bearings and sliding parts as recommended by manufacturer.

3.2 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling grilles.

END OF SECTION

SECTION 08 34 73 – SOUND CONTROL DOOR ASSEMBLIES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this section, as shown or specified, shall be in accordance with the requirements of the Contract documents.

1.2 WORK INCLUDED

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the furnishing and installation of Sound Retardant Steel Doors as shown on the drawings and specified herein.

1.3 RELATED WORK

- A. Consult all other Sections to determine the extent of work specified elsewhere but related to this Section. This work shall be properly coordinated to produce an installation satisfactory to the Owner.

1.4 SUBMITTALS

- A. Submit certified copies of 1/3 Octave Band Transmission Loss Test Data and STC rating for Sound Retardant Steel Doors as issued by an accredited independent Acoustical Laboratory. STC rating is assigned to specific door openings as shown on the Door Schedules.
- B. Submit Shop Drawings for fabrication and installation of door panels, door frames, hardware, and acoustical seals. Shop drawings shall include detail assembly drawings, showing the complete installation, a listing of materials, surface finishes, fabricating assembly and installation tolerances. No Shop Drawing shall be submitted which shows details or components that deviate from those shown or described on Construction Documents. A request for deviations must be submitted in writing to Architect for review and approval.
- C. Provide a Schedule of door assemblies using the same reference numbers for details and openings as those shown on Construction Documents.
- D. Submit with proposal a Schedule indicating a comparison of the Acoustical Performance and hardware requirements of these Specifications with the Acoustical Performance and hardware offered in the proposal.

1.5 PRODUCT HANDLING

- A. Deliver hollow metal work crated to provide protection during job storage. Use all means necessary to protect the material of this Section before, during and after installation and to protect the installed work and materials of all other trades. Inspect for damage prior to installation.. Minor damage may be repaired on jobsite on approval; otherwise, replace damaged item.

1.6 QUALITY ASSURANCE

- A. The manufacturer of Sound Retardant Steel Doors shall have a minimum 5 years experience in the fabrication and installation of acoustically-rated door assemblies similar to those of this Section.
- B. Laboratory Certification: Acoustical testing of submitted doors assemblies shall be conducted in an accredited independent acoustical laboratory. Sound transmission loss values in dB in each 1/3 octave band from 100 Hz to 5000 Hz shall be determined in accordance with ASTM E90-90. Sound Transmission Class (STC) rating shall be determined in accordance with ASTM E413-87.
- C. Certification of acoustical tests must be submitted by Contractor for approval prior to installation.
- D. The Contractor shall employ an organization and personnel who are trained and skilled mechanics with previous experience in the installation of similar precision fabricated assemblies.
- E. Fabrication shall not proceed until written approval of Submittal has been issued.
- F. The force in pounds required to open and operate each door panel shall be in accordance with the requirements of the Americans with Disabilities Act.
- G. Sound Retardant Door assemblies shall be manufactured by one of the following:
 - 1. Overly Manufacturing Company, Greensburg, PA 724-834-7300
 - 2. Krieger Steel Products Company, Pico Rivera, CA 562-695-0645
 - 3. Industrial Acoustics Company, Bronx, NY 718-931-8000

1.7 FIELD CERTIFICATION

- A. Contractor shall guarantee acoustical performance in the field of the Sound Retardant Steel Doors. The acoustical performance rating in the field shall not be less than a Noise Isolation Class (NIC) 0 dB lower than the laboratory STC rating of the door assembly when tested in the field in accordance with the noise reduction test procedure ASTM 336-75.
- B. The field test will be conducted by the Architect's acoustical consultant. The manufacturer's representatives should be present to observe testing procedures and conditions. Approval of test data to be given by Architect or representative of Architect.

- C. The requirement that the Contractor, at the time of bidding, submit certification of STC rating as obtained in an accredited acoustical laboratory, is mandatory. The guarantee of the achievement of acoustical performance of the NIC rating in the field will not be accepted as a substitute for the laboratory test certification. Complete compliance with the acoustical performance specifications, both laboratory and field, is required of the Contractor to be eligible as a bidder on the furnishing and installation of the Sound Retardant Steel Doors.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Cold rolled sheet steel: Per ASTM A366 and ASTM A568.
- B. Supports and anchors: Fabricate not less than 14 ga. sheet metal of shapes and sizes required to secure frames to partitions and concrete floor.
- C. Shop applied paint: For all steel surfaces use rust-inhibitive type primer paint suitable for finish coat of paint applied in the field.
- D. Fabrication: Hollow metal units to be rigid and free of defects, warp or buckle.
- E. Finish hardware preparation: Prepare hollow metal units to receive mortised and concealed finish hardware, including cutouts, reinforcing plates, and drilling and tapping as required. Provide reinforcing plates for surface mounted items. Weight of door panels to be considered.

2.2 REINFORCEMENT

- A. Reinforce door panels for required hardware as follows:
- B. Hinges: 3/8" steel plate x 6" longer than hinge. Secure with not less than 6 spot-welds.
- C. Mortised Latchsets with Lever Handles: 14 gauge steel sheet with not less than 2 spot-welds.
- D. Surface Mounted Closers: 12 gauge steel sheet secured with not less than 6 spot-welds.

2.3 TYPE STC-51 SOUND INSULATING DOOR ASSEMBLY <Door 152>

- A. Acoustical Performance: The acoustical performance requirements are that the door assembly (door frame, panel and acoustical seals, including astragal where scheduled) shall have not less than an STC 51 and include expanded specifications concerning sound transmission loss (TL) values in dB for each 1/3 octave band from 100 Hz to 5000 Hz, including a TL at the 125 Hz 1/3 octave band which shall be a minimum 44 dB and a minimum of 46 dB at 250 Hz.
- B. Fabrication: The steel frame shall be 14 gauge cold rolled steel, reinforced continuously at jambs and head. The frame shall be of a "slip-in" configuration, and shall abut and terminate to specific partition construction as shown on Drawings. The sound insulating door panel shall be 5" thick, having cold rolled 14 ga. steel panel facings and continuously welded edges. The door shall be provided with a mortised astragal where scheduled on the

drawings. The weight of door panel shall not exceed 34.3 pounds per square foot. Provide acoustical seals equal to those installed for certification tests.

PART 3 - EXECUTION

3.1 GENERAL

- A. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all is complete to the point where this installation may properly commence. Verify that Door Assemblies may be installed in complete accordance with the original design and the approved Shop Drawings. In the event of discrepancy, immediately notify the Architect immediately in writing.
- B. Shop prefabricate all doors and frames into complete units, verifying all measurements at the site prior to fabrication. Knock-down frames shall not be approved.
- C. Fabricate in strict accordance with approved Shop Drawings. Accurately miter and fit all members to hairline joints. Weld or mechanically fasten along entire line of contact on the unexposed side.
- D. Install units in accordance with manufacturer's recommendations. The manufacturer shall provide a trained engineer or mechanic at the jobsite to supervise the unloading, erection, final adjustments, and final check out of the Door Assemblies, including door panels, frames, hardware, and accessories.
- E. Back of steel frame shall be packed solid with minimum 6 pcf mineral wool batt insulation prior to installation when installed in drywall partition, or filled with grout prior to installation when installed in block partition.
- F. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set.
- G. Tightly caulk openings between steel frame and adjoining partition with clear silicone sealant.
- H. Door frames shall be delivered to jobsite with a steel spreader connecting the bottom legs of the frame to ensure non-racking. Spreader does not determine the opening width.
- I. Fit doors accurately in frames with clearances recommended by the manufacturer.
- J. Apply clear silicone sealant to jamb and head seals prior to application to frame.
- K. Check and readjust the operating finish hardware items just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.

END OF SECTION

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Exterior storefront framing.
- B. Storefront framing for punched openings.
- C. Exterior manual-swing entrance doors

1.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
 - 1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 - 2. Dimensional tolerances of building frame and other adjacent construction.
 - 3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Noise or vibration created by wind and by thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Failure of operating units.
- B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Wind Loads: As indicated on Drawings.
- D. UFC Applicable Explosive Weight: Type 1
- E. Conventional Construction Standoff Distance: 82 Feet
- F. Deflection of Framing Members:
 - 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed $L/175$ of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to $L/360$ of clear span or $1/8$ inch, whichever is smaller
- G. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
1. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 2. Test Durations: 10 seconds.
- H. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft..
- I. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittal:
1. Product Data for Credit IEQ 4.1: For sealants used inside of the weatherproofing system, including printed statement of VOC content.
- C. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
- D. Samples: For each type of exposed finish required.
- E. Other Action Submittals:
1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.
- F. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- G. Product test reports.
- H. Field quality-control reports.

- I. Maintenance data.
- J. Warranties: Sample of special warranties.

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. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
- E. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.
- F. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide YKK AP America Inc.; YHS 50 TU Series or comparable product by one of the following:
1. Kawneer North America; an Alcoa company.
 2. TRACO.
 3. Tubelite.
 4. Oldcastle Building Envelope.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Sheet and Plate: ASTM B 209.
 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Structural Profiles: ASTM B 308/B 308M.
 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally broken.
 2. Glazing System: Retained mechanically with gaskets on four sides.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 2. Reinforce members as required to receive fastener threads.

3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from stainless steel.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials .
- F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
 1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Section 08 80 00 - Glazing.
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 1. Door Construction: 2- to 2-1/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior
 2. Door Design: Medium stile; 3-1/2-inch nominal width.
 - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
 3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.
- B. Entrance Door Hardware: As specified in Division 08 Section "Door Hardware."

2.6 ACCESSORY MATERIALS

- A. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils.
 - 1. Custom Color and Gloss: Match Centria Metal Panel, color MTL-01, 971 Chromium Gray.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Section 07 92 00 - Joint Sealants, to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Section 08 80 00 - Glazing.

G. 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.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows. Do not proceed

with installation of the next area until test results for previously completed areas show compliance with requirements.

1. 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. Test Area: A minimum area of 75 feet by 1 story of aluminum-framed systems
- C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION

SECTION 08 42 26 - ALL-GLASS ENTRANCES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior manual-swinging all-glass entrances ,<Door 161.>

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details, including the following:
 - 1. Plans, elevations, and sections.
 - 2. Details of fittings and glazing, including isometric drawings of rail fittings.
 - 3. Door hardware locations, mounting heights, and installation requirements.
- C. Samples: For each type of exposed finish indicated.
- D. Other Action Submittals:
 - 1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.
- E. Product test reports.
- F. Warranty: Sample of special warranty.
- G. Maintenance data.

1.3 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 all-glass systems from single source from single manufacturer.
- C. Accessible All-Glass Entrance Doors: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines, ICC/ANSI A117.1, and North Carolina State Building Code.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of all-glass systems that do not comply with requirements or that fail in materials or workmanship within specified 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 one of the following:
1. Blumcraft of Pittsburgh.
 2. Oldcastle Glass, Inc.
 3. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.

2.2 MATERIALS

- A. Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), tested for surface and edge compression per ASTM C 1048 and for impact strength per 16 CFR 1201 for Category II materials.
1. Class 1: Clear monolithic.
 - a. Thickness: 1/2 inch.
 - b. Locations: As indicated on door schedule.
 2. Exposed Edges: Machine ground and flat polished.
 3. Butt Edges: Flat ground.
 4. Corner Edges: Lap-joint corners with exposed edges polished.
- B. Aluminum Extrusions: ASTM B 221, with strength and durability characteristics of not less than Alloy 6063-T5.
1. Stainless-Steel Cladding: ASTM A 666, Type 304.

2.3 METAL COMPONENTS

- A. Fitting Configuration:
1. Manual-Swinging, All-Glass Entrance Doors: Continuous rail fitting at top and bottom.

B. Rail Fittings:

1. Material: Stainless-steel-clad aluminum.
2. Height:
 - a. Top Rail: 4 inches.
 - b. Bottom Rail: 6 inches.
3. Profile: Square.
4. End Caps: Manufacturer's standard precision-fit end caps for rail fittings.

C. Anchors and Fastenings: Concealed.

2.4 ENTRANCE DOOR HARDWARE

- A. General: Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of rail fittings.
- B. Exit Device and door pulls: As selected by Architect from manufacturer's full range.
- C. Cylinders, closers and stop as indicate in Section 08 71 00 - Door Hardware

2.5 FABRICATION

- A. Provide holes and cutouts in glass to receive hardware, fittings, and accessory fittings before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.
 1. Fully temper glass using horizontal (roller-hearth) process, and fabricate so that when glass is installed, roll-wave distortion is parallel with bottom edge of door or lite.
- B. Factory assemble components and factory install hardware and fittings to greatest extent possible.

2.6 STAINLESS-STEEL FINISHES

- A. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 1. Directional Satin Finish: No. 4.
 2. Mirrorlike Reflective, Nondirectional Polish: No. 8.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all-glass doors and associated components according to manufacturer's written instructions.
- B. Set units level, plumb, and true to line, with uniform joints.
- C. Maintain uniform clearances between adjacent components.
- D. Lubricate hardware and other moving parts according to manufacturer's written instructions.
- E. Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.

END OF SECTION

SECTION 08 44 13 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes conventionally glazed aluminum curtain walls installed as stick assemblies.

1.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of manufacturer's standard glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Glazed aluminum curtain walls shall withstand movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Wind Loads: As indicated on Drawings.
- D. UFC Applicable Explosive Weight: Type 1
- E. Conventional Construction Standoff Distance: 82 feet.
- F. Structural-Test Performance: Test according to ASTM E 330 as follows:
 - 1. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 - 2. Test Durations: 10 seconds.
- G. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding $L/175$ of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to $3/4$ inch, whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to $L/360$ of clear span or $1/8$ inch, whichever is smaller.
 3. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175.
- H. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..
- I. Energy Performance: Glazed aluminum curtain wall shall have certified and labeled energy performance ratings in accordance with NFRC.
- J. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.57 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
1. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.35 as determined according to NFRC 200.
 2. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.30 cfm/sq. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft..

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
1. Product Data for Credit IEQ 4.1: For glazing sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
 2. Laboratory Test Reports for Credit IEQ 4.1: For glazing sealants used inside the weatherproofing system, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.
1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
 - a. Joinery, including concealed welds.

- b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
- D. Samples: For each type of exposed finish required.
- E. Delegated-Design Submittal: For glazed aluminum curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer
- B. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.
- C. Product test reports.
- D. Field quality-control reports.
- E. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- C. 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.
- D. Energy Performance Standards: Comply with NFRC for minimum standards of energy performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
 - 1. Provide NFRC-certified glazed aluminum curtain walls with an attached label.

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

1.7 WARRANTY

- A. Special Assembly Warranty: Standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain walls that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide YHC 300 SSG 7.5" , (Horizontal SSG - refer to drawings) by YKK AP America, Inc., or comparable product by one of the following:
1. Kawneer North America; an Alcoa company.
 2. TRACO.
 3. Tubelite.
 4. Oldcastle Building Envelope.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Sheet and Plate: ASTM B 209.
 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Structural Profiles: ASTM B 308/B 308M.
 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: With manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.

3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING

- A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 1. Construction: Thermally broken.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Front.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 2. Reinforce members as required to receive fastener threads.
 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- D. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials]
- F. Framing Sealants: Manufacturer's standard sealants.

2.4 GLAZING

- A. Glazing: Comply with Section 08 80 00 - Glazing.
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.
 1. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the

Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 ACCESSORY MATERIALS

- A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.6 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from interior
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Fabricate components that, when assembled, have the following characteristics:
 - 1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
 - 2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
- E. Factory-Assembled Frame Units:
 - 1. Rigidly secure nonmovement joints.
 - 2. Seal joints watertight unless otherwise indicated.
 - 3. Install glazing to comply with requirements in Section 08 80 00 - Glazing.
- F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF resin by weight in color coat.
 - 1. Color and Gloss: Match Centria Metal Panel color MTL-01, 971 Chromium Gray.

PART 3 - EXECUTION

3.1 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. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
 - 7. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install glazing as specified in Section 08 80 00 - Glazing.

3.2 ERECTION TOLERANCES

- A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment:

- a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing and inspecting of representative areas of glazed aluminum curtain walls shall take place as installation proceeds to determine compliance of installed assemblies with specified requirements.
 1. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article, but not more than 0.50 cfm/sq. ft. of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft..
 - a. Test Area: One bay wide, but not less than 30 feet, by one story of glazed aluminum curtain wall.
 - b. Perform a minimum of two tests in areas as directed by Architect.
 - c. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 25 percent completion
 2. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.
 - a. Test Area: One bay wide, but not less than 30 feet, by one story of glazed aluminum curtain wall.
 - b. Perform a minimum of two tests in areas as directed by Architect.
 - c. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 25percent completion
- C. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding Doors
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware, power supplies, back-ups and surge protection.
 - 3. Automatic operators.
 - 4. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Section 01 78 23 – Operations and Maintenance Data
 - 2. Section 08 11 13 – Hollow Metal Doors and Frames
 - 3. Section 08 14 16 – Flush Wood Doors
 - 4. Section 08 41 13 – Aluminum-Framed Entrances and Storefronts.
 - 5. Section 08 80 00 – Glazing
 - 6. Section 09 90 00 – Painting and Coating
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ANSI/SDI A250.13 - Testing and Rating of Severe Windstorm Resistant Components for Swing Door Assemblies.
 - 3. ASTM E1886 - Test Method for Performance of Exterior Windows, Curtin Walls, Doors and Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
 - 4. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure difference.
 - 5. ASTM E1996 - Standard specification for performance of exterior windows, curtain walls, doors and storm shutters impacted by Windborne Debris in Hurricanes.
 - 6. ICC/IBC - International Building Code.
 - 7. NFPA 70 - National Electrical Code.
 - 8. NFPA 80 - Fire Doors and Windows.
 - 9. NFPA 101 - Life Safety Code.
 - 10. NFPA 105 - Installation of Smoke Door Assemblies.
 - 11. TAS-201-94 - Impact Test Procedures.

12. TAS-202-94 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components using Uniform Static Air Pressure.
13. TAS-203-94 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
14. NCSBC 2009 – North Carolina Building Code.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.2 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

- C. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary Integrated Wiegand Access Control Products.
- D. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.
- E. Informational Submittals:
 - 1. LEED Submittals: Manufacturer's product information and applicable sustainability program credits that are available to contribute towards a LEED rated project certification.
 - a. Credit MR 4: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Use materials with recycled content such that the sum of the post-consumer recycled content plus one-half of the pre-consumer content constitutes 20% (based on cost) of the total value of the material in the project as follows:
 - 1) Cylindrical Locks: 58%
 - 2) Mortise Locks: 57%
 - 3) Exit Devices: 54%
 - 4) Door Closers: 51%
 - 5) Overhead Stops: 46%
 - b. Low-Emitting Materials EQ 4.2: Provide products that reduce the quantity of indoor air contaminants that are odorous, irritating, and/or harmful to the comfort and well-being of installers and occupants; products shall not produce VOC emissions.
 - 2. Hurricane Resistant Openings: Exterior hurricane opening assemblies to be tested according to ASTM E330, ASTM E1886, ASTM E1996 standards, and certified by a qualified independent third party testing agency acceptable to authority having jurisdiction, with labeling indicating compliance with the wind load and design pressure level requirements specified for the Project.
 - 3. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Operation and Maintenance Data. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

- G. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.3 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 3 years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
 - 1. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- D. Integrated Wiegand, Wireless, and IP-Enabled Access Control Products Supplier Qualifications: Integrated access control products and accessories are required to be supplied and installed through current members of the ASSA ABLOY "Authorized Channel Partner" (ACP) and "Certified Integrator" (CI) programs. Suppliers and Installers are to be factory trained, certified, and a direct purchasers of the specified products and be responsible for commissioning and servicing the installed equipment indicated for the Project.
- E. Automatic Operator Supplier Qualifications: Power operator products and accessories are required to be supplied and installed through current members of the manufacturer's "Power Operator Preferred Installer" program. Suppliers are to be factory trained, certified, and a direct purchaser of the specified power operators and be responsible for the installation and maintenance of the units and accessories indicated for the Project.
- F. Source Limitations: Obtain each type and variety of Door Hardware specified in this Section from a single source, qualified supplier unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

- G. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:
1. NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
 - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
 3. NFPA 101: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Thresholds: Not more than 1/2 inch high.
 4. Fire-Rated Door Assemblies: Provide door hardware for 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 252 (neutral pressure at 40" above sill) or UL-10C.
 - a. Test Pressure: Positive pressure labeling.
- H. Hurricane Resistant Exterior Openings: Provide exterior door hardware as complete and tested assemblies, or component assemblies, including approved doors and frames specified under Section 081113 "Hollow Metal Doors and Frames", to meet the wind loads, design pressures, debris impact resistance, and glass and glazing requirements applicable to the Project.
1. Test units according to ASTM E330, ASTM E1886, ASTM E1996 standards, certified by a qualified independent third party testing agency acceptable to authority having jurisdiction, and bearing a third party certification agency permanent label indicating windstorm approved product.

- I. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- J. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Management and Coordination." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- K. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Management and Coordination" with attendance by representatives of Suppliers, Installer, and Contractor to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, arrange for manufacturers' representatives to hold a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check

Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.6 WARRANTY

- A. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
 - 1. Ten years for mortise locks and latches.
 - 2. Five years for exit hardware.
 - 3. Ten years for manual door closers.
 - 4. Two years for electromechanical door hardware.

1.7 MAINTENANCE SERVICE

- A. 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 door hardware.
- B. Continuing Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance including repair and

replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide only ANSI/BHMA Certified door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
 - 1. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - a. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
 - 2. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
 - a. Permanent cylinders, cores, and keys to be integrated by Owner.
- B. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity, unless otherwise indicated:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

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2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior entry & exit doors and other high-frequency locations: Heavy weight, non-ferrous, hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, hinges unless Hardware Sets indicate heavy weight.
 - c. All hinges 5-knuckle design and shall feature oil-impregnated bushings (2 or 4 per hinge) as standard.
 4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
 - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
 - 1) Out-swinging exterior doors.
 - 2) Out-swinging access controlled doors.
 5. Acceptable Manufacturers:
 - a. Hager Companies
 - b. McKinney Products (MK).
 - c. Stanley Hardware
- B. Continuous Geared Hinges: ANSI/BHMA A156.26 certified continuous geared hinge with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Provide concealed flush mount (with or without inset), full surface, or half surface, in standard and heavy duty models, as specified in the Hardware Sets. Concealed continuous hinges to be U.L. listed for use on up to and including 90 minute rated door installations and U.L. listed for windstorm components where applicable. Factory cut hinges for door size and provide with removable service power transfer panel where indicated at electrified openings.
1. Acceptable Manufacturers:
 - a. McKinney Products (MK).
 - b. Pemko Manufacturing
 - c. Select Products.

2.3 POWER TRANSFER DEVICES

- A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
1. Acceptable Manufacturers:
 - a. Hager Companies - ETW-QC (12 wires) Option.
 - b. McKinney Products (MK) - QC (12 wires) Option.
- B. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a 12" removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
1. Acceptable Manufacturers:
 - a. McKinney Products (MK) - SER-QC (12 wires) Option.
 - b. Pemko Manufacturing (PE) - SER (12 wires) Option.
- C. Monitoring Switch Hinges: Monitoring switch hinges to be magnetic reed, concealed, adjustable switch type with extra heavy magnet.
- D. Provide mortar guard enclosure on steel frames installed at masonry openings for each electrical hinge specified.
- E. Electric Door Hardware Cords: Provide electric transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
1. Acceptable Manufacturers:
 - a. McKinney Products (MK) - Inner Door Cord 3 inches: QC-C012P.
 - b. McKinney Products (MK) - Inner Door Cord 3 foot door: QC-C300P.
 - c. McKinney Products (MK) - Inner Door Cord 4 foot door: QC-C400P.
 - d. McKinney Products (MK) - Inner Door Cord 15 feet: QC-C1500P.
 - e. McKinney Products (MK) - Hinge to Junction Panel 15 feet: QC-C1500P.

Provide one each of the following tools as part of the base bid contract:

- a. McKinney Products (MK) - Electrical Connecting Kit: 52-3000.
- b. McKinney Products (MK) - Connector Hand Tool: 52-0439.

2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified automatic, self-latching, and manual flush bolts and surface bolts. Manual flush bolts to be furnished with top rod of sufficient length to allow bolt location approximately six feet from the floor. Furnish dust proof strikes for bottom bolts. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

1. Acceptable Manufacturers:

- a. McKinney Architectural Hardware.
- b. Rockwood Manufacturing (RO).
- c. Trimco.

- B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Coordinators fabricated from steel with nylon-coated strike plates and built-in adjustable safety release.

1. Acceptable Manufacturers:

- a. McKinney Architectural Hardware.
- b. Rockwood Manufacturing (RO).
- c. Trimco.

- C. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified below or in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

- 1. Push/Pull Plates: Minimum .050 inch thick, 4-inches wide by 16-inches high, with square corners and beveled edges, secured with exposed screws unless otherwise indicated.
- 2. Straight Pull Design: Minimum 1-inch round diameter stainless steel bar or tube stock pulls with 2 1/2-inch projection from face of door unless otherwise indicated.
- 3. Custom Cast Pulls: Fabricate from cast brass or bronze per architect's selection. Plate as required to match standard pulls or push bars.
- 4. Push Bars: Minimum 1-inch round diameter horizontal push bars with minimum clearance of 2 1/2-inch projection from face of door unless otherwise indicated.
- 5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

a. Acceptable Manufacturers:

- 1) McKinney Architectural Hardware.
- 2) Rockwood Manufacturing (RO).
- 3) Trimco.

2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. Cylinders: Original manufacturer, patent-protected cylinders complying with the following:
 - 1. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
 - 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 3. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
- D. Security Cylinders: ANSI/BHMA A156.5, Grade 1, patented security cylinders and keys able to be used together under the same facility master or grandmaster key system. Cylinders are to be factory keyed.
 - 1. Acceptable Manufacturers:
 - a. Sargent Manufacturing (SA) - Signature Series.
 - b. Yale Locks and Hardware (YA) - 5000 Series.
- E. Keying System: Each type of lock and cylinders to be factory keyed. Conduct specified "Keying Conference" to define and document keying system instructions and requirements. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner. Incorporate decisions made in keying conference, and as follows:
 - 1. Master Key System: Cylinders are operated by a change key and a master key.
 - 2. Grand Master Key System: Cylinders are operated by a change key, a master key, and a grand master key.
 - 3. Great-Grand Master Key System: Cylinders are operated by a change key, a master key, a grand master key, and a great-grand master key.
 - 4. Existing System: Master key or grand master key locks to Owner's existing system.
 - 5. Keyed Alike: Key all cylinders to same change key.
- F. Key Quantity: Provide the following minimum number of keys:
 - 1. Top Master Key: One (1)
 - 2. Change Keys per Cylinder: Two (2)
 - 3. Master Keys (per Master Key Group): Two (2)
 - 4. Grand Master Keys (per Grand Master Key Group): Two (2)
 - 5. Construction Control Keys (where required): Two (2)
- G. Construction Keying: Provide construction master keyed cylinders or temporary keyed construction cores where specified. Provide construction master keys in quantity as required by project Contractor. Replace construction cores with permanent cores. Furnish permanent cores for installation as directed under specified "Keying Conference".

- H. Key Registration List: Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
- I. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall expansion capacity of 150% of the number of locks required for the project.
 - 1. Acceptable Manufacturers:
 - a. Lund Equipment (LU).
 - b. Telkee (TK).
- J. Key Control Software: Provide one network version of "Key Wizard" branded key management software package that includes one year of technical support and upgrades to software at no charge.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified mortise locksets furnished in the functions as specified in the Hardware Sets. Locksets to be manufactured with a corrosion resistant, stamped 12 gauge minimum formed steel case and be field-reversible for handing without disassembly of the lock body. Lockset trim (including knobs, levers, escutcheons, roses) to be the product of a single manufacturer. Furnish with standard 2 3/4" backset, 3/4" throw anti-friction stainless steel latchbolt, and a full 1" throw stainless steel bolt for deadbolt functions.
 - 1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware – ML2000 Series.
 - b. Sargent Manufacturing (SA) – 8200 Series.
 - c. Yale Locks and Hardware – 8800FL Series.
- B. Lock Trim Design: As specified in Hardware Sets.
- C. Hurricane and Tornado Resistance Compliance: Mechanical locking and latching devices to be U.L. listed for windstorm components where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.

2.7 ELECTROMECHANICAL LOCKING DEVICES

- A. Hurricane and Tornado Resistance Compliance: Electromechanical locking devices to be U.L. listed for windstorm components where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.

2.8 INTEGRATED WIEGAND OUTPUT ACCESS CONTROL LOCKING DEVICES

- A. Integrated Wiegand Output Mortise Locks: Wiegand output ANSI A156.13, Grade 1, mortise lockset with integrated proximity card reader, request-to-exit signaling, door position status switch, and latchbolt monitoring in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle trim, 3/4" deadlocking anti-friction latch, and 1" case-hardened steel deadbolt. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.
1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand compatible access control systems. Latchbolt monitoring and door position switch act in conjunction to report door-in-frame (DPS) and door latched (door closed and latched) conditions.
 2. Reader supports either HID 125 kHz proximity (up to 39 bits, including Corporate 1000) or 13.56 MHz (2K-32K) iClass® credentials.
 3. 12VDC external power supply required for reader and lock, with optional 24VDC operation available with iClass® reader (125 kHz reader is always 12VDC). Fail safe or fail secure options.
 4. Installation requires only one cable run from the lock to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
 5. Installation to include manufacturer's access control panel interface board or module where required for Wiegand output protocol.
 - a. Acceptable Manufacturers:
 - 1) Corbin Russwin Hardware - Access 600 - ML20600 RNE1 Series.
 - 2) Sargent Manufacturing (SA) - Harmony - H1 8200 Series.
 - 3) Yale Locks and Hardware - Symphony - S8800 SYM Series.

2.9 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
- B. Standards: Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 3. Strikes for Auxiliary Deadlocks: BHMA A156.5.
 4. Dustproof Strikes: BHMA A156.16.

2.10 CONVENTIONAL EXIT DEVICES

- A. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Mounting rails to be formed from smooth stainless steel, brass or bronze architectural materials no less than 0.072" thick, with push rails a minimum of 0.062" thickness. Painted or aluminum metal rails are not acceptable. Exit device latch to be investment cast stainless steel, pullman type, with deadlock feature.

1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware - ED4000 / ED5000 Series.
 - b. Sargent Manufacturing (SA) - 80 Series.
 - c. Yale Locks and Hardware - 7000 Series.

2.11 ELECTROMECHANICAL CONVENTIONAL EXIT DEVICES

- A. Electrified Conventional Push Rail Devices (Heavy Duty): Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified below.

1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware - ED4000 / ED5000 Series.
 - b. Sargent Manufacturing (SA) - 80 Series.
 - c. Yale Locks and Hardware - 7000 Series.

- B. Electrified Options: As indicated in hardware sets, provide electrified exit device options including: electric latch retraction, electric dogging, outside door trim control, exit alarm, delayed egress, latchbolt monitoring, lock/unlock status monitoring, touchbar monitoring and request-to-exit signaling. Unless otherwise indicated, provide electrified exit devices standard as fail secure.

- C. Hurricane and Tornado Resistance Compliance: Electromechanical conventional exit devices and electrified tube steel removable mullions to be U.L. listed for windstorm components where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.

2.12 INTEGRATED WIEGAND OUTPUT ACCESS CONTROL EXIT DEVICES

- A. Wiegand Output Integrated Card Reader Exit Hardware: Wiegand output ANSI 156.3 Grade 1 rim, mortise, and vertical rod exit device hardware with integrated proximity card reader, latchbolt and touchbar monitoring, and request-to-exit signaling, in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle exit trim with 3/4" throw latch bolt. U.L listed and labeled for either panic or "fire exit hardware" for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.

1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand compatible access control systems. Inside push bar (request-to-exit) signaling and door position (open/closed status) monitoring (via separately connected DPS).
2. Reader supports either HID 125 kHz proximity (up to 39 bits, including Corporate 1000) or 13.56 MHz (2K-32K) iClass® credentials.
3. 12VDC external power supply required for reader, with optional 24VDC operation available with iClass® reader (125 kHz reader is always 12VDC). 24VDC required for solenoid operated exit trim (12VDC if applicable). Fail safe or fail secure options.
4. Installation requires only one cable run from the exit hardware to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
5. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware - Access 600 - ED5000 RNE1 Series.
 - b. Sargent Manufacturing - Harmony - H1 80 Series.
 - c. Yale Security (YA) - Symphony -7100 SYM Series.

- B. Hurricane and Tornado Resistance Compliance: Integrated Wiegand electronic access control exit devices to be U.L. listed for windstorm components where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.

2.13 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
2. Standards: Closers to comply with UL-10C and UBC 7-2 for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1 provisions for door opening force and delayed action closing.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 - a. Where closers are indicated to have mechanical dead-stop, provide heavy duty arms and brackets with an integral positive stop.
 - b. Where closers are indicated to have mechanical hold open, provide heavy duty units with an additional built-in mechanical holder assembly designed to hold open

- against normal wind and traffic conditions. Holder to be manually selectable to on-off position.
- c. Where closers are indicated to have a cushion-type stop, provide heavy duty arms and brackets with spring stop mechanism to cushion door when opened to maximum degree.
- 5. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt or security type fasteners as specified in the door Hardware Sets.
- 6. Hurricane and Tornado Resistance Compliance: Door closers to be U.L. listed for windstorm components where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.
- B. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 certified surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units with high impact, non-corrosive plastic covers standard.
 - 1. Provide closers complete with fasteners, brackets, spacers and drop plates as required for a complete installation.
 - 2. Acceptable Manufacturers:
 - a. Norton Door Controls - 7500 Series.
 - b. Sargent Manufacturing (SA) - 1431 Series.
 - c. Yale Locks and Hardware - 4400 Series.

2.14 ARCHITECTURAL TRIM

A. Door Protective Trim

- 1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
- 2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
- 3. Metal Protection Plates: ANSI/BHMA A156.6 certified metal protection plates (kick, armor, or mop), beveled on four edges (B4E), fabricated from the following.
 - a. Stainless Steel: 050-inch thick, with countersunk screw holes (CSK).

4. Fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets.
5. Acceptable Manufacturers:
 - a. McKinney Architectural Hardware.
 - b. Rockwood Manufacturing (RO).
 - c. Trimco.

2.15 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Acceptable Manufacturers:
 - a. McKinney Architectural Hardware.
 - b. Rockwood Manufacturing (RO).
 - c. Trimco.
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 1. Acceptable Manufacturers:
 - a. Rixson Door Controls (RF).
 - b. Rockwood Manufacturing.
 - c. Sargent Manufacturing.

2.16 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: 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 UL-10C.
 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Hurricane and Tornado Resistance Compliance: Architectural seals to be U.L. listed for windstorm components where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.
- G. Acceptable Manufacturers:
 1. McKinney Weatherstripping Products.
 2. Pemko Manufacturing (PE).
 3. Reese Enterprises, Inc.

2.17 ELECTRONIC ACCESSORIES

- A. Wiegand Test Unit: Test unit verifies proper Wiegand output integrated card reader lock installation in the field by testing for proper wiring, card reader data integrity, and lock functionality including lock/unlock, door position, and request-to-exit status. 12 or 24VDC voltage adjustable operating as Fail Safe or Fail Secure.
 1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware - WT1 Wiegand Test Unit.
 - b. Sargent Manufacturing (SA) - WT1 Wiegand Test Unit.
 - c. Yale Locks and Hardware – WT1Wiegand Test Unit.
- B. Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
 1. Acceptable Manufacturers:
 - a. Security Door Controls - 630 Series.
 - b. Securitron Door Controls (SU) - BPS 12/24 Series.

2.18 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.19 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. Antimicrobial Finishes: Where specified, finishes on locksets, latchsets, exit devices and push/pull trim to incorporate an FDA recognized. Silver Ion, antimicrobial coating (MicroShield™) listed for use on equipment as a suppressant to the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Integrated Wiegand access control products are required to be installed through current members of the ASSA ABLOY "Certified Integrator" (CI) program.
- D. Power Operator products and accessories are required to be installed through current members of the manufacturer's "Power Operator Preferred Installer" program.
- E. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- F. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- G. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish, and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SCHEDULE

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. Manufacturer's Abbreviations:
 - 1. MK - McKinney
 - 2. RO - Rockwood
 - 3. SA - Sargent
 - 4. RF - Rixson
 - 5. NO - Norton
 - 6. PE - Pemko
 - 7. SU - Securitron
 - 8. LU - Lund Equipment Co., Inc.
- C. Hardware Schedule

Hardware Schedule

Set: 1.0

Doors: 101B, 160B

Description: Exterior Aluminum Handicap Entry/Exit

1 Electrical Continuous Hinge	MCK-12HD SER-12 MM	CL	MK
1 Automatic Operator	6960L D SN-134	689	NO
1 Exit Device (rim, exit only)	10 16 SG 21 55 8510 GMK	US32D	SA
1 Pull	RM3020-24	US32	RO
1 HCP Wall Switch	685		NO
1 HCP Mullion Switch	676		NO
1 Threshold	171AK WS10SS		PE
1 Sweep	3151CN		PE
1 ElectroLynx Harness	QC-C1500		MK
1 ElectroLynx Harness	QC-C1500P		MK

Notes: Perimeter Gasket by Frame Manufacturer.

Prep door and frame for electronic device. Provide flex conduit in door. Coordinate electrical requirements with electrical contractor.

The aluminum door hardware specified is listed as a basis of design for Windstorm rating. If alternate hardware is proposed, please provide compliance information to architect.

OPERATION: Handicap actuator either side cycles operator when active leaf device is manually dogged.

Set: 2.0

Doors: 101A, 103A, 160A

Description: Exterior Aluminum Entry/Exit

1 Electrical Continuous Hinge	MCK-12HD SER-12 MM	CL	MK
1 Exit Device (rim, exit only)	10 16 SG 21 55 8510 GMK	US32D	SA
1 Pull	RM3020-24	US32	RO
1 Cylinder	10 21 34 GMK	US26D	SA
1 Door Closer (surface w/stop arm)	SRI TB 1431 CPS 1431D 581-2	EN	SA
1 Threshold	171AK WS10SS		PE
1 Sweep	3151CN		PE

Notes: Perimeter Gasket by Frame Manufacturer.

Prep door and frame for electronic device. Provide flex conduit in door.

The aluminum door hardware specified is listed as a basis of design for Windstorm rating. If alternate hardware is proposed, please provide compliance information to architect.

Set: 2.1

Doors: 102A, 102B

Description: Exterior Aluminum Alarmed Exit-Only

1 Electrical Continuous Hinge	MCK-12HD SER-12 MM	CL	MK
1 Exit Device (rim, exit only)	AL 10 SG 21 8510 GMK	US32D	SA
1 Door Closer (surface w/stop arm)	SRI TB 1431 CPS 1431D 581-2	EN	SA
1 Threshold	171AK WS10SS		PE
1 Sweep	3151CN		PE
1 Wiring Harness	546-F		SA
1 Power Supply	3267		SA

Notes: Perimeter Gasket by Frame Manufacturer.

Prep door and frame for electronic device. Provide flex conduit in door.

The aluminum door hardware specified is listed as a basis of design for Windstorm rating. If alternate hardware is proposed, please provide compliance information to architect.

Set: 3.0

Doors: 101D, 160D

Description: Aluminum Vestibule Handicap Access

1 Continuous Hinge	MCK-12HD	CL	MK
1 Push Bar	43	US32D	RO
1 Pull	RM3020-24	US32	RO
1 HCP Wall Switch	685		NO
1 Automatic Operator	6960L D SN-134	689	NO

Notes: OPERATION: Handicap actuator either side cycles operator. Door opens automatically in sequence with exterior door. Coordinate electrical requirements with electrical contractor.

Set: 4.0

Doors: 101C, 103D, 160C

Description: Aluminum Vestibule

1 Continuous Hinge	MCK-12HD	CL	MK
1 Push Bar	43	US32D	RO
1 Pull	RM3020-24	US32	RO
1 Door Closer (surface w/stop arm)	SRI TB 1431 CPS 1431D 581-2	EN	SA

Set: 5.0

Doors: 152D

Description: Handicap Vestibule Pair

6 Hinge (heavy weight)	T4A3786 NRP 5" x 4-1/2"	US26D	MK
2 Push Bar	43	US32D	RO
2 Pull	RM3020-24	US32	RO
1 Door Closer (surface w/stop arm)	TB 1431 CPS 1431D 581-2	EN	SA
1 HCP Wall Switch	685		NO
1 HCP Mullion Switch	676		NO
2 Automatic Operator	6960L D SN-134	689	NO
1 Riser Diagram	EL-DIA-1000		SA

Notes: OPERATION: Handicap actuator either side cycles operator.Coordinate electrical requirements with electrical contractor.

Set: 6.0

Doors: 126B

Description: Exterior Card Access Entry/Exit

1 Electrical Hinge	T4A3386 QC-12 5" x 4-1/2"	US32D	MK
1 Hinge (heavy weight)	T4A3386 MM x EHM 5" x 4-1/2"	US32D	MK
1 Hinge (heavy weight)	T4A3386 NRP 5" x 4-1/2"	US32D	MK
1 Access Control Rim Exit	HC SG 56-H2-8810	US32D	SA
1 Cylinder	10 21 34 GMK	US26D	SA
1 Door Pull	Y111 TB	US32D	RO
1 Door Closer (surface w/stop arm)	1431 CPS	EN	SA
1 Power Supply	BPS-24-2		SU
1 Threshold	171AK WS10SS		PE
1 Sweep	3151CN		PE
1 ElectroLynx Harness	QC-C1500P		MK
1 ElectroLynx Harness	QC-C012		MK
1 Kick Plate	K1050 8"	US32D	RO

Notes: Perimeter Gasket by Frame Manufacturer.The door hardware specified is listed as a basis of design for Windstorm rating. If alternate hardware is proposed, please provide compliance information to architect.

Access Control Panel and Security Management Software by Security Integrator.

Prep door and hinge jamb for electronic device. Furnish wiring harness in door per specifications.

OPERATION: Outside integral reader temporarily retracts latchbolt: auto-relock.Electronic function is fail-secure with outside key override. Inside pushbar always allows egress.

Set: 7.0

Doors: 137B

Description: Exterior Card Access Receiving Door

1 Hinge (heavy weight)	T4A3386 NRP 5" x 4-1/2"	US32D	MK
1 Electrical Hinge	T4A3386 QC-12 5" x 4-1/2"	US32D	MK
1 Hinge (heavy weight)	T4A3386 MM x EHM 5" x 4-1/2"	US32D	MK
1 Integrated Card Reader Lock	10 SG 21 H2-82271 TRMD GMK	US26D	SA
1 Door Closer (surface w/stop & holder)	1431 CPSH	EN	SA
1 Kick Plate	K1050 8"	US32D	RO
1 Threshold	171AK WS10SS		PE
1 Sweep	3151CN		PE
1 ElectroLynx Harness	QC-C1500P		MK
1 ElectroLynx Harness	QC-C400		MK
1 Power Supply	BPS-24-2		SU

Notes: Perimeter Gasket by Frame Manufacturer. The door hardware specified is listed as a basis of design for Windstorm rating. If alternate hardware is proposed, please provide compliance information to architect.

Access Control Panel and Security Management Software by Security Integrator.

Prep door and hinge jamb for electronic device. Furnish wiring harness in door per specifications.

OPERATION: Outside integral reader temporarily unlocks outside lever: auto-relock. Electronic function is fail-secure with outside key override. Inside lever always allows egress.

Set: 8.0

Doors: 141

Description: Exterior Electrical Room Exit - NEC

3 Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK
1 Door Closer (surface w/stop & holder)	1431 CPSH	EN	SA
1 Threshold	171AK WS10SS		PE
1 Sweep	3151CN		PE
1 Exit Device	11 21 76 WS 8804 PSB GMK	US32D	SA

Notes: Perimeter Gasket by Frame Manufacturer. The door hardware specified is listed as a basis of design for Windstorm rating. If alternate hardware is proposed, please provide compliance information to architect.

Set: 8.1

Doors: 140

Description: Exterior Electrical Room Exit - NEC

3 Hinge	TA2314 NRP 5" x 4-1/2"	US32D	MK
1 Door Closer (surface w/stop & holder)	1431 CPSH	EN	SA
1 Threshold	171AK WS10SS		PE
1 Sweep	3151CN		PE
1 Exit Device	11 21 76 WS 8804 PSB GMK	US32D	SA

Notes: Perimeter Gasket by Frame Manufacturer. The door hardware specified is listed as a basis of design for Windstorm rating. If alternate hardware is proposed, please provide compliance information to architect.

Set: 9.0

Doors: 118

Description: Exterior Exit

4 Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK
1 Exit Device (exit only)	10 16 SG 21 55 WS 8810 GMK	US32D	SA
1 Cylinder	10 21 34 GMK	US26D	SA
1 Pull	RM3020-24	US32	RO
1 Door Closer (surface w/stop arm)	1431 CPS	EN	SA
1 Kick Plate	K1050 8"	US32D	RO
1 Threshold	171AK WS10SS		PE
1 Sweep	3151CN		PE

Notes: Perimeter Gasket by Frame Manufacturer. The door hardware specified is listed as a basis of design for Windstorm rating. If alternate hardware is proposed, please provide compliance information to architect.

Set: 10.0

Doors: 152A, 152B

Description: Exterior Aluminum Exit Pair

2 Hinge (heavy weight)	T4A3386 NRP 5" x 4-1/2"	US32D	MK
2 Electrical Hinge	T4A3386 QC-12 5" x 4-1/2"	US32D	MK
2 Hinge (heavy weight)	T4A3386 MM x EHM 5" x 4-1/2"	US32D	MK
1 Removable Mullion	10 HCL980 GMK	PC	SA
2 Door Closer (surface w/stop arm)	1431 CPS	EN	SA

2 Kick Plate	K1050 8"	US32D	RO
2 Exit Device (rim, exit only)	AL 10 SG 21 8510 GMK	US32D	SA
1 Threshold	171AK WS10SS		PE
2 Sweep	3151CN		PE
2 Astragal Seal	S771D		PE
2 ElectroLynx Harness	QC-C1500P		MK
2 ElectroLynx Harness	QC-C012		MK
2 Wiring Harness	546		SA
1 Power Supply	3267		SA
1 Riser Diagram	EL-DIA-1000		SA
2 Split Astragal	29310CP		PE

Notes: Perimeter Gasket by Frame Manufacturer.

The aluminum door hardware specified is listed as a basis of design for Windstorm rating. If alternate hardware is proposed, please provide compliance information to architect.

OPERATION: Inside pushbar has integral alarm, which sounds when bar is pressed. Inside cylinder shunts alarm. No outside trim - Exit Only.

Set: 11.0

Doors: 152C

Description: Exterior Aluminum Exit Pair with Handicap Access

2 Electrical Continuous Hinge	MCK-12HD SER-12 MM	CL	MK
1 Exit Device (CVR, nightlatch)	11 16 SG 21 AD8410 106 GMK	US32D	SA
1 Exit device (CVR, exit only)	11 16 SG 21 AD8410 GMK	US32D	SA
2 Pull	RM3020-24	US32	RO
2 Automatic Operator	6960L D SN-134	689	NO
2 HCP Mullion Switch	676		NO
1 Threshold	171AK WS10SS		PE
2 Sweep	3151CN		PE
2 ElectroLynx Harness	QC-C1500P		MK
2 ElectroLynx Harness	QC-C012		MK

Notes: Perimeter Gasket by Door & Frame Manufacturer. Coordinate electrical requirements with electrical contractor.

The door hardware specified is listed as a basis of design for Windstorm rating. If alternate hardware is proposed, please provide compliance information to architect.

OPERATION: Handicap actuator either side cycles operators when active leaf device is manually dogged.

Set: 12.0

Doors: 126A

Description: Rated Passage/ Exit Pair

3 Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Exit Device (surface vertical rod, exit only)	12 NB SG 8710	US32D	SA
2 Door Closer (surface)	TB 1431 O	EN	SA
2 Silencer	608		RO
1 Exit Device (surface vertical rod, passage)	12 NB SG 8715 ETMD	US32D	SA
2 Surface Overhead Stop	9-X36	652	RF

Set: 13.0

Doors: 147

Description: Exit Pair

6 Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Exit Device (surface vertical rod, exit only)	10 NB 16 SG 21 8710 GMK	US32D	SA
2 Door Closer (surface w/stop & holder)	1431 CPSH	EN	SA
2 Wall Stop	409	US32D	RO
1 Exit Device (surface vertical rod, classroom)	10 NB 16 SG 21 8713 ETMD GMK	US32D	SA
2 Silencer	608		RO

Set: 13.1

Doors: 148

Description: Exit Pair with sound seals

6 Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Exit Device (surface vertical rod, classroom)	10 NB 16 SG 21 8713 ETMD GMK	US32D	SA
1 Exit Device (surface vertical rod, exit only)	10 NB 16 SG 21 8710 GMK	US32D	SA
1 Door Closer (surface w/stop & holder)	1431 CPSH	EN	SA
2 Wall Stop	409	US32D	RO
2 Door Bottom	4301CNBL		PE
1 Astragal Seal	S771D		PE

Notes: Perimeter Sound Gasket by Frame Manufacturer.

Set: 14.0

Doors: 152

Description: STC 51 Exit Pair

1 Exit Device (surface vertical rod, classroom)	10 NB 16 SG 21 8713 ETMD GMK	US32D	SA
1 Exit Device (surface vertical rod, exit only)	10 NB 16 SG 21 8710 GMK	US32D	SA
2 Door Closer (surface w/stop & holder)	1431 CPSH	EN	SA
2 Wall Stop	409	US32D	RO

Notes: Cam-lift hinges and perimeter gasketing by accoustical door and frame manufacturer.

Set: 15.0

Doors: 103B

Description: Gift Shop

3 Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Exit Device	10 16 SG 21 8813 ETMD GMK	US32D	SA
1 Door Closer (surface w/stop arm)	1431 CPS	EN	SA
3 Silencer	608		RO

Set: 16.0

Doors: 109A, 109B

Description: Classroom

3 Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Classroom Lock	10 SG 21 8237 TRMD GMK	US26D	SA
1 Door Closer (surface)	TB 1431 PH10	EN	SA
1 Kick Plate	K1050 8"	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 17.0

Doors: 137D

Description: Classroom Function with H O Closer

3 Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Door Closer (surface)	TB 1431 H	EN	SA
1 Kick Plate	K1050 8"	US32D	RO
1 Wall Stop	409	US32D	RO

1 Classroom Lock	10 SG 21 8237 TRMD GMK	US26D SA
3 Silencer	608	RO

Set: 17.1

Doors: 106

Description: Classroom Function with H O Closer

3 Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D MK
1 Classroom Lock	10 SG 21 8237 TRMD GMK	US26D SA
1 Door Closer (surface)	TB 1431 H	EN SA
1 Wall Stop	409	US32D RO
3 Silencer	608	RO

Set: 18.0

Doors: 133B, 133D

Description: Classroom Function with Closer

3 Hinge (heavy weight)	T4A3786 NRP 5" x 4-1/2"	US26D MK
1 Classroom Lock	10 SG 21 8237 TRMD GMK	US26D SA
1 Door Closer (surface)	TB 1431 P10	EN SA
1 Kick Plate	K1050 8"	US32D RO
1 Wall Stop	409	US32D RO

Notes: Perimeter Gasket by Frame Manufacturer.

Set: 19.0

Doors: 130A, 130B

Description: Kitchen

3 Hinge (heavy weight)	T4A3786 NRP 5" x 4-1/2"	US26D MK
1 Surface Overhead Holder	9-X26	652 RF
1 Door Closer (surface)	TB 1431 O	EN SA
1 Armor Plate	K1050 36"	US32D RO
1 Classroom Lock	10 SG 21 8237 TRMD GMK	US26D SA
3 Silencer	608	RO

Set: 20.0

Doors: 114

Description: Boardroom Pair

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
2 Flush Bolt	555	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Classroom Lock	10 SG 21 8237 TRMD GMK	US26D	SA
2 Surface Overhead Stop	9-X36	652	RF
1 Astragal	357SS		PE
2 Silencer	608		RO

Set: 21.0

Doors: 132

Description: Delayed Egress with inside card reader override.

2 Hinge (heavy weight)	T4A3786 NRP 5" x 4-1/2"	US26D	MK
1 Electrical Hinge	T4A3786 QC-12 5" x 4-1/2"	US26D	MK
1 Exit Device	10 SG 21 59 8813 ETMD GMK	US32D	SA
1 Door Closer (surface)	TB 1431 O	EN	SA
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO
1 ElectroLynx Harness	QC-C1500P		MK
1 ElectroLynx Harness	QC-C400		MK
1 Power Supply	BPS-24-2		SU
1 Reader	6120		SA

Notes: Access Control Panel and Security Management Software by Security Integrator.

Prep door and hinge jamb for electronic device. Furnish wiring harness in door per specifications.

OPERATION: Outside integral reader temporarily unlocks outside lever: auto-relock. Electronic function is fail-secure with outside key override. Inside lever always allows egress. Lock contains Door Position Switch and RX.

Set: 22.0

Doors: 113

Description: Rated Card Access Entry/Exit

2 Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Electrical Hinge	T4A3786 QC-12 4-1/2" x 4-1/2"	US26D	MK
1 Exit Device with Card Reader	HC 10 12 SG 21 H2-8876 ETMD GMK	US32D	SA

1 Electromagnetic Holder	998	689	RF
1 ElectroLynx Harness	QC-C1500P		MK
1 Power Supply	BPS-24-2		SU
1 Door Closer (surface)	TB 1431 P10	EN	SA

Notes: Perimeter Gasket by Frame Manufacturer.

Access Control Panel and Security Management Software by Security Integrator.

Prep door and hinge jamb for electronic device. Furnish wiring harness in door per specifications.

OPERATION: Outside integral reader temporarily unlocks outside lever: auto-relock. Electronic function is fail-secure with outside key override. Inside lever always allows egress. Lock includes Door Position Switch and RX. Door is held open during open hours by wall magnet, which is tied to the fire alarm system for release upon system activation.

Set: 23.0

Doors: 138B, 139A

Description: Card Access Collection Storage

5 Hinge (heavy weight)	T4A3786 NRP 5" x 4-1/2"	US26D	MK
1 Electrical Hinge	T4A3786 QC-12 5" x 4-1/2"	US26D	MK
2 Monitor Hinge	T4A3786 MM x EHM NRP 5" x 4-1/2"	US26D	MK
1 Flush Bolt	555	US26D	RO
1 Flush Bolt (Top)	555 24"	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Integrated Card Reader Lock	10 SG 21 H2-82271 TRMD GMK	US26D	SA
1 Door Closer (surface)	TB 1431 O	EN	SA
2 Surface Overhead Holder	9-X26	652	RF
1 ElectroLynx Harness	QC-C400		MK
1 ElectroLynx Harness	QC-C1500P		MK
1 Power Supply	BPS-24-2		SU
2 Armor Plate	K1050 36"	US32D	RO

Notes: Perimeter Gasket by Frame Manufacturer.

Access Control Panel and Security Management Software by Security Integrator.

Prep door and hinge jamb for electronic device. Furnish wiring harness in door per specifications.

OPERATION: Outside integral reader temporarily unlocks outside lever: auto-relock. Electronic function is fail-secure with outside key override. Inside lever always allows egress. Lock includes Door Position Switch and RX.

Set: 24.0

Doors: 144

Description: Card Access Collection Storage

7 Hinge (heavy weight)	T4A3786 NRP 5" x 4-1/2"	US26D	MK
1 Electrical Hinge	T4A3786 QC-12 5" x 4-1/2"	US26D	MK
1 Flush Bolt (Top)	555 24"	US26D	RO
1 Flush Bolt	555	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Integrated Card Reader Lock	10 SG 21 H2-82271 TRMD GMK	US26D	SA
1 Surface Overhead Holder	9-X26	652	RF
1 Door Closer (surface)	TB 1431 O	EN	SA
2 Armor Plate	K1050 36"	US32D	RO
1 ElectroLynx Harness	QC-C1500P		MK
1 ElectroLynx Harness	QC-C400		MK
1 Power Supply	BPS-24-2		SU

Notes: Perimeter Gasket by Frame Manufacturer.

Access Control Panel and Security Management Software by Security Integrator.

Prep door and hinge jamb for electronic device. Furnish wiring harness in door per specifications.

OPERATION: Outside integral reader temporarily unlocks outside lever: auto-relock. Electronic function is fail-secure with outside key override. Inside lever always allows egress. Lock includes Door Position Switch and RX.

Set: 25.0

Doors: 161

Description: Gallery Entry/Exit Full Glass

2 Cylinder	10 21 41 GMK	US26D	SA
2 Floor Closer	428S SHO 90 PH	626	RF
1 Removable Stop	60131	626	RF

Notes: Blumcraft exit devices and door pulls by door manufacturer.

Verify cylinder compatibility with manufacturer's hardware.

Set: 26.0

Doors: 104, 116, 117, 119, 120, 121, 122

Description: Office

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK

1 Office Lock	10 SG 21 8205 TRMD GMK	US26D	SA
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 26.1

Doors: 136

Description: Rated Office

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Office Lock	10 SG 21 8205 TRMD GMK	US26D	SA
1 Door Closer (surface)	TB 1431 O	EN	SA
1 Wall Stop	409	US32D	RO

Notes: Perimeter Gasket by Frame Manufacturer.

Set: 27.0

Doors: 111

Description: Family Toilet

3 Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK
1 Mortise Lock (privacy)	SG 49 8265 TRMD	US26D	SA
1 Door Closer (surface)	TB 1431 O	EN	SA
1 Kick Plate	K1050 8"	US32D	RO
1 Mop Plate	K1050 4"	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 28.0

Doors: 110A, 110B, 112A, 112B, 158, 159

Description: Push-Pull Restrooms

3 Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK
1 Push Plate	70F	US32D	RO
1 Pull Plate	111x70C TB	US32D	RO
1 Door Closer (surface w/stop arm)	TB 1431 CPS	EN	SA
1 Kick Plate	K1050 8"	US32D	RO
1 Mop Plate	K1050 4"	US32D	RO
3 Silencer	608		RO

Set: 29.0

Doors: 155, 156

Description: Push-Pull Restrooms

3 Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK
1 Push Plate	70F	US32D	RO
1 Pull Plate	111x70C TB	US32D	RO
1 Surface Overhead Stop	9-X36	652	RF
1 Door Closer (surface)	TB 1431 O	EN	SA
1 Kick Plate	K1050 8"	US32D	RO
1 Mop Plate	K1050 4"	US32D	RO
3 Silencer	608		RO

Set: 30.0

Doors: 150

Description: Push-Pull Theater - Light Lock

3 Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK
1 Push Plate	70F	US32D	RO
1 Pull Plate	111x70C TB	US32D	RO
1 Door Closer (surface w/stop arm)	TB 1431 CPS	EN	SA
1 Kick Plate	K1050 8"	US32D	RO
1 Mop Plate	K1050 4"	US32D	RO
2 Door Bottom	4301CNBL		PE
2 Astragal Seal	S771D		PE

Notes: Perimeter Gasket by Frame Manufacturer.

Set: 31.0

Doors: 105, 123, 124, 145, 149, 154

Description: Storeroom

3 Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom Lock	10 SG 21 8204 TRMD GMK	US26D	SA
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 31.1

Doors: 128

Description: Storeroom with O H Stop

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	10 SG 21 8204 TRMD GMK	US26D	SA
1	Surface Overhead Holder	9-X26	652	RF
3	Silencer	608		RO

Set: 32.0

Doors: 127, 131B, 153, 201

Description: Mechanical Room with Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	10 SG 21 76 8204 TRMD GMK	US26D	SA
1	Door Closer (surface)	TB 1431 O	EN	SA
1	Kick Plate	K1050 8"	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608		RO

Notes: Perimeter gasket by frame manufacturer at fire rated openings.

Set: 32.1

Doors: 133C

Description: Rated Mechanical Room Access

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	10 SG 21 76 8204 TRMD GMK	US26D	SA
1	Door Closer (surface w/stop arm)	1431 CPS	EN	SA

Notes: Perimeter gasket by frame manufacturer.

Set: 33.0

Doors: 131C

Description: Mechanical Room with Closer

3	Hinge	TA2714 5" x 4-1/2"	US26D	MK
1	Storeroom Lock	10 SG 21 76 8204 TRMD GMK	US26D	SA
1	Surface Overhead Holder	9-X26	652	RF
1	Door Closer (surface)	TB 1431 O	EN	SA

1	Kick Plate	K1050 8"	US32D	RO
3	Silencer	608		RO

Notes: Perimeter gasket by frame manufacturer at fire rated openings.

Set: 34.0

Doors: 146

Description: Control Room

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	10 SG 21 8204 TRMD GMK	US26D	SA
1	Door Closer (surface)	TB 1431 O	EN	SA
1	Wall Stop	409	US32D	RO
1	Door Bottom	4301CNBL		PE

Notes: Perimeter Gasket by Frame Manufacturer.

Set: 35.0

Doors: 134

Description: Storeroom Pair

6	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
2	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Surface Overhead Stop	9-X36	652	RF
2	Armor Plate	K1050 36"	US32D	RO
1	Storeroom Lock	10 SG 21 8204 TRMD GMK	US26D	SA
1	Wall Stop	409	US32D	RO
2	Silencer	608		RO

Notes: Overlapping Astragal by Door Manufacturer

Set: 36.0

Doors: 139B

Description: Collection Storage Pair

10	Hinge (heavy weight)	T4A3786 NRP 5" x 4-1/2"	US26D	MK
1	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Flush Bolt (Top)	555 24"	US26D	RO

1	Classroom Lock	10 SG 21 8237 TRMD GMK	US26D	SA
2	Surface Overhead Holder	9-X26	652	RF
2	Armor Plate	K1050 36"	US32D	RO
1	Astragal	357SS		PE
2	Silencer	608		RO

Set: 37.0

Doors: 131A

Description: Exterior Mechanical Room

3	Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK
1	Mortise Lock (storeroom deadbolt)	10 SG 21 76 8251 TRMD GMK	US26D	SA
1	Door Closer (surface w/stop & holder)	1431 CPSH	EN	SA
1	Threshold	171AK WS10SS		PE
1	Sweep	3151CN		PE

Notes: Perimeter Gasket by Frame Manufacturer. The door hardware specified is listed as a basis of design for Windstorm rating. If alternate hardware is proposed, please provide compliance information to architect.

Provide 1 MM X EHM hinge at door 131A only.

Set: 37.1

Doors: 133A

Description: Exterior Corridor Exit

3	Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK
1	Exit Device	11 21 WS 8804 PSB GMK	US32D	SA
1	Door Closer (surface w/stop & holder)	1431 CPSH	EN	SA
1	Threshold	171AK WS10SS		PE
1	Sweep	3151CN		PE

Notes: Perimeter Gasket by Frame Manufacturer. The door hardware specified is listed as a basis of design for Windstorm rating. If alternate hardware is proposed, please provide compliance information to architect.

Set: 37.2

Doors: 143

Description: Exterior Storeroom Pair

6	Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK
2	Surface Bolt	585-12	US26D	RO

1	Mortise Lock (storeroom deadbolt)	10 SG 21 8251 TRMD GMK	US26D	SA
1	Door Closer (surface w/stop & holder)	1431 CPSH	EN	SA
1	Threshold	171AK WS10SS		PE
2	Sweep	3151CN		PE
1	Astragal Seal	S771D		PE

Notes: Overlapping Astragal by Door Manufacturer

Perimeter Gasket by Frame Manufacturer.

The door hardware specified is listed as a basis of design for Windstorm rating. If alternate hardware is proposed, please provide compliance information to architect.

Set: 38.0

Doors: 103C, 137A, 137C, 138A, 138C

Description: Overhead Doors

4	Cylinder	10 21 41 GMK	US26D	SA

Notes: Balance of Hardware by Door Manufacturer.

Set: 39.0

Doors: AR

Description: Additional Requirements

1	Electrical Connecting Kit	52-3000		SA
1	Connector Hand Tool	52-0439		SA
1	Test Unit	WT1		SA
20	Contactless Thin Card	13.56MHz iClass		HD
1	Wall Mounted Key Cabinet	1200		LU
1	Riser Diagram	EL-DIA-1000		SA
1	Wiring Diagram	PTP-WD-1100		SA
1	Key Management Software	KW-SS1		SA
1	Masterkey CD	DLKW1		SA

END OF SECTION 087100

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Doors.
 - 2. Glazed curtain walls.
 - 3. Storefront framing.
 - 4. Glazed entrances.
 - 5. All-glass entrances and storefront.

1.2 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For glazing sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Credit IEQ 4.1: For glazing sealants used inside the weatherproofing system, documentation indicating that they comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Preconstruction adhesion and compatibility test report.

1.3 QUALITY ASSURANCE

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.4 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.5 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
1. Warranty Period: Five years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which 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 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design glass, including comprehensive engineering analysis according to ICC's International Building Code by a qualified professional engineer, using the following design criteria:
 1. Design Wind Pressures: As indicated on Drawings.
 2. UFC Applicable Explosive Weight: Type 1
 3. Conventional Construction Standoff Distance: 82 feet
 4. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
 5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

2.2 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- C. Windborne-Debris-Impact Resistance: Provide exterior glazing that passes basic-protection testing requirements in ASTM E 1996 for Wind Zone 3 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on the Project and shall be installed in same manner as glazing indicated for use on the Project.
 1. Large-Missile Test: For glazing located within 30 feet of grade.
 2. Small-Missile Test: For glazing located more than 30 feet above grade.
- D. 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. 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.

2. 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.
3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
- C. Acid-Etched Glass: ASTM C 1048, Type I, Quality-Q3, Class I (clear) of kind and condition indicated, acid-etched.
- D. Clear, Low-E Glass: Subject to compliance with requirements. Clear, Low-E glass with coating on surface no. 2.
 1. Basis-of-Design Product: PPG "Solarban 70XL "Solexia" or comparable product by one of the following:
 - a. Guardian Industries.
 - b. Oldcastle BuildingEnvelope.
 - c. Pilkington.
 - d. Viracon

2.4 LAMINATED GLASS

- A. Windborne-Debris-Impact-Resistant Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, with "Windborne-Debris-Impact Resistance" Paragraph in "Glass Products, General" Article, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 1. Construction: Laminate glass with one of the following to comply with interlayer manufacturer's written recommendations:
 - a. Polyvinyl butyral interlayer.
 - b. Polyvinyl butyral interlayers reinforced with polyethylene terephthalate film.
 - c. Ionoplast interlayer.
 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 3. Interlayer Color: Clear unless otherwise indicated.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
1. Sealing System: Dual seal.
 2. Spacer: Aluminum with mill or clear anodic finish.

2.6 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
1. Neoprene complying with ASTM C 864.
 2. EPDM complying with ASTM C 864.
 3. Silicone complying with ASTM C 1115.
 4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

2.7 GLAZING SEALANTS

- A. General:
1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

2.8 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.

2.9 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.10 MONOLITHIC-GLASS TYPES

- A. Glass Type (GL-4): Clear laminated, fully tempered float glass.
 1. Thickness of each glass ply: 1/4 inch.
 - a. Outer pane: 1/4 inch clear, Low-E glass.
 - b. Inner pane: 1/4 inch clear, fully tempered glass.
 2. Provide safety glazing labeling.
- B. Glass Type (GL-5): Acid-etched, fully tempered float glass.
 1. Thickness: 1/4 inch.
 2. Provide safety glazing labeling.
- C. Glass Type (GL-6): Clear, fully tempered float glass.
 1. Thickness: 1/4 inch.
 2. Provide safety glazing labeling.
- D. Glass Type (GL-7): Clear, annealed float glass.
 1. Thickness: 1/4 inch.

2.11 INSULATING-LAMINATED-GLASS TYPES

- A. Glass Type (GL-1): Clear, Low-E, laminated, insulated glass unit.
1. Overall Unit Thickness: Nominal 1.25 inch thick.
 2. Thickness of Outdoor Lite: 1/4 inch.
 3. Outdoor Lite: Clear, Low-E, heat-strengthened float glass.
 4. Interspace Content: Air.
 5. Indoor Lite: Clear laminated glass with two plies of heat-strengthened float glass.
 - a. Thickness of Each Glass Ply: 1/4 inch.
 - b. Interlayer Thickness: 0.090 inch.
 6. Winter Nighttime U-Factor: 0.28 maximum.
 7. Summer Daytime U-Factor: 0.26 maximum.
 8. Solar Heat Gain Coefficient: 0.25 maximum.
- B. Glass Type (GL-2): Clear Low-E, laminated, insulated glass unit.
1. Overall Unit Thickness: Nominal 1.25 inch thick.
 2. Thickness of Outdoor Lite: 1/4 inch.
 3. Outdoor Lite: Clear, Low-E, fully tempered float glass.
 4. Interspace Content: Air.
 5. Indoor Lite: Clear laminated glass with two plies of heat-strengthened float glass.
 - a. Thickness of Each Glass Ply: 1/4 inch.
 - b. Interlayer Thickness: 0.090 inch.
 6. Winter Nighttime U-Factor: 0.28 maximum.
 7. Summer Daytime U-Factor: 0.26 maximum.
 8. Solar Heat Gain Coefficient: 0.25 maximum.
- C. Glass Type (GL-3): Acid-etched, Low-E, laminated, insulated glass unit.
1. Overall Unit Thickness: Nominal 1.25 inch thick.
 2. Thickness of Outdoor Lite: 1/4 inch.
 3. Outdoor Lite: Clear, Low-E, heat-strengthened float glass.
 4. Interspace Content: Air.
 5. Indoor Lite: Laminated glass with two plies of heat-strengthened float glass.
 - a. Thickness of Each Glass Ply: 1/4 inch.
 - b. Interlayer Thickness: 0.090 inch.
 - c. Surface #6 shall be acid-etched.

PART 3 - EXECUTION**3.1 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. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

- E. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.3 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. 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.
- C. 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.
- D. Install gaskets so they protrude past face of glazing stops.

3.4 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.

3.5 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION

SECTION 08 83 00 - MIRRORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Annealed monolithic silvered flat glass mirrors.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.
- C. Samples:
 - 1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.

1.3 QUALITY ASSURANCE

- A. Glazing Publications: Comply with GANA's "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRRORS

- A. Glass Mirrors, General: ASTM C 1503.
- B. Clear Glass: Mirror Glazing Quality, with frosted banding.
 - 1. Nominal Thickness: 5.0 mm.

2.2 FABRICATION

- A. Mirror Edge Treatment: Flat polished. Seal edges of mirrors with edge sealer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Wall-Mounted Mirrors: Install mirrors with mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
- C. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- D. Do not permit edges of mirrors to be exposed to standing water.
- E. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- F. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

END OF SECTION

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Non-load-bearing steel framing members for the following applications:
 - 1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
 - 2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittal:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. Sound Transmission Characteristics: For STC-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: manufacturer's standard corrosion-resistant zinc coating, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.
- B. Hanger Attachments to Concrete:
 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
- D. Furring Channels (Furring Members):
 1. Cold-Rolled Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
 2. Steel Studs: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.0312 inch.
 - b. Depth: 2-1/2 inches.
 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base Metal Thickness: 0.0179 inch.
 4. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.
- E. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 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. Armstrong World Industries, Inc.; Drywall Grid Systems.

- b. Chicago Metallic Corporation; Fire Front 650-C Drywall Furring System.
- c. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Steel Studs and Runners: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: As indicated on Drawings .
- B. Slip-Type Head Joints:
 - 1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Steel Network Inc. (The); VertiClip SLD Series.
 - 2) Superior Metal Trim; Superior Flex Track System (SFT).
- C. Firestop Track: As specified in Division 07 Section "Fire-Resistive Joint Systems."
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Metal Thickness: 0.0312 inch
- E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base Metal Thickness: 0.0179 inch.
 - 2. Depth: 7/8 inch.
- F. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
 - 1. Configuration: Asymmetrical or hat shaped.
- G. Cold-Rolled Furring Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges.
 - 1. Depth: 3/4 inch
 - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch.
 - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch- diameter wire.
- H. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.4 AUXILIARY MATERIALS

- A. Fasteners for Metal 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: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 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.

3.2 INSTALLING SUSPENSION SYSTEMS

- A. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- B. 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. Do not attach hangers to steel roof deck.
 - 4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - 6. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- C. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

- 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 measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.3 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install tracks (runners) 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 penetrating 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 runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- C. Z-Furring Members:
 - 1. Erect insulation (specified in Division 07 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 inches o.c.

2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

END OF SECTION

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior gypsum board.
- B. Tile backing panels.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
- C. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
 - 2. Product Data for Credit IEQ 4.1: For adhesives used to laminate gypsum board panels to substrates, including printed statement of VOC content.

1.3 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 RECYCLED CONTENT OF GYPSUM PANELS

- A. Provide gypsum panel products with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 25 percent by weight.

2.2 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
 1. Manufacturers: Subject to compliance with requirements, manufacturers offering moisture- and mold-resistant gypsum board that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum Co.
 - b. G-P Gypsum.
 - c. Lafarge North America Inc.
 - d. National Gypsum Company.
 - e. PABCO Gypsum.
 - f. Temple.
 - g. USG Corporation.
- B. Type X:
 1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
- C. Flexible Type: Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
 1. Thickness: 1/4 inch.
 2. Long Edges: Tapered.
- D. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.
 1. Thickness: 1/2 inch.
 2. Long Edges: Tapered.

- E. Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation and through-penetration (impact resistance) than standard, regular-type and Type X gypsum board.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.

2.3 TILE BACKING PANELS

- A. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M or ASTM C 1396/C 1396M.

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. American Gypsum Co.
- b. G-P Gypsum.
- c. Lafarge North America Inc.
- d. National Gypsum Company.
- e. PABCO Gypsum.
- f. Temple.
- g. USG Corporation.

2. Core: 1/2 inch, regular type.

- B. Cementitious Backer Units: ANSI A108.1.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

- a. Custom Building Products; Wonderboard.
- b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
- c. USG Corporation; DUROCK Cement Board.

2. Thickness: 1/2 inch.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel .
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.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Paper.
 - 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 - 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 or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
- D. Joint Compound for Tile Backing Panels:
 - 1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
 - 2. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

3.2 INSTALLATION

- A. Install gypsum board in the following locations:
 1. Type X: Vertical surfaces, unless otherwise indicated.
 2. Ceiling Type: Ceiling surfaces.
- B. Water-Resistant Gypsum Backing Board: In areas to be tiled more than 5 feet from a plumbing fixture.
- C. Cementitious Backer Units: ANSI A108.1, at locations indicated to receive tile that are within 5 feet of a plumbing fixture.
- D. Where tile backing panels about other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.3 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. Refer to drawings for indicated locations, and specific requirements of Architect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners, unless otherwise indicated.

2. Bullnose Bead: Use at outside corners
3. U-Bead: Use at exposed panel edges

3.4 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile.
 3. Level 3: Where indicated on Drawings.
 4. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.
 5. Level 5: Where indicated on Drawings.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.5 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, 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 blotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 30 00 - TILING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Porcelain tile.
- B. Crack isolation membrane.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittal:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
 - 3. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured materials. Include statement indicating cost for each regionally manufactured material.
 - a. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.
 - 4. Product data for Credit IEQ 4.1: For adhesives and sealants, including printed statement of VOC content.
- C. Shop Drawings: Show transitions, locations where cut outs are required, location of control joints, locations where membranes are to be installed, type of installation, pattern, location and direction.
- D. Samples:
 - 1. Each type and composition of tile and for each color and finish required.
 - 2. Assembled samples, with grouted joints, for each type and composition of tile and for each color and finish required.

1.3 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build 4 foot by 4 foot mockup of each type of floor and base tile installation.
 2. Build 4 foot by 4 foot mockup of each type of wall tile installation.
 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 EXTRA MATERIALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering 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.

PART 2 - PRODUCTS**2.1 TILE PRODUCTS**

- A. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. Tile Type <**PORC-01**>: Floor Tile.
1. Basis-of-Design Product: As indicated on Drawings.
 2. Composition: Porcelain.
 3. Base tile as follows to match:
 - a. <**PTB-01**>: Coved.
 - b. <**PTB-02**>: Coved with bullnose top edge.
- C. Tile Type <**PORC-02**>: Wall tile.
1. Basis-of-Design Product: As indicated on Drawings.
 2. Grout Color: As selected by Architect from manufacturer's full range.
 3. Base tile to match <**PTB-02**>
- D. Tile Type <**GT-01**>: Glazed wall tile.
1. Basis-of-Design Product: As indicated on Drawings.
 2. Grout Color: As selected by Architect from manufacturer's full range.

2.2 CRACK ISOLATION MEMBRANE

- A. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
 - 1. Products: Subject to compliance with requirements, provide one of the following
 - a. Bostik, Inc.; Durabond D-222.
 - b. C-Cure; CureLastic 949.
 - c. Custom Building Products; Redgard Waterproofing and Crack Prevention Membrane
 - d. Mer-Kote Products, Inc.; Fracture-Guard 5000.
 - e. TEC, a subsidiary of H. B. Fuller Company; HydraFlex - Waterproofing Crack Isolation Membrane.

2.3 SETTING MATERIALS

- A. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.
 - 1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Boiardi Products; a QEP company.
 - b. Bonsal American; an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. Jamo Inc.
 - g. Laticrete International, Inc.
 - h. MAPEI Corporation.
 - i. Southern Grouts & Mortars, Inc.
 - j. Summitville Tiles, Inc.
 - k. TEC; a subsidiary of H. B. Fuller Company.
 - 2. For wall applications, provide nonsagging mortar.
- B. Latex-Portland Cement Mortar (Thin Set): ISO 13007
 - 1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Boiardi Products; a QEP company.
 - b. Bonsal American; an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. Jamo Inc.
 - g. Laticrete International, Inc.
 - h. MAPEI Corporation.

- i. Mer-Kote Products, Inc.
 - j. Southern Grouts & Mortars, Inc.
 - k. Summitville Tiles, Inc.
 - l. TEC; a subsidiary of H. B. Fuller Company.
 - 2. For wall applications, provide nonsagging mortar.
- C. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.
- 1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Atlas Minerals & Chemicals, Inc.
 - b. Bonsal American; an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. Jamo Inc.
 - g. Laticrete International, Inc.
 - h. MAPEI Corporation.
 - i. Mer-Kote Products, Inc.
 - j. Southern Grouts & Mortars, Inc.
 - k. Summitville Tiles, Inc.
 - l. TEC; a subsidiary of H. B. Fuller Company.
- D. Organic Adhesive: ANSI A136.1, Type I.
- 1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bonsal American; an Oldcastle company.
 - b. Bostik, Inc.
 - c. C-Cure.
 - d. Custom Building Products.
 - e. DAP Inc.
 - f. Jamo Inc.
 - g. Laticrete International, Inc.
 - h. MAPEI Corporation.
 - i. Southern Grouts & Mortars, Inc.
 - j. Summitville Tiles, Inc.
 - k. TEC; a subsidiary of H. B. Fuller Company.

2.4 GROUT MATERIALS

- A. Standard Cement Grout: ANSI A118.6.
- 1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Boiardi Products; a QEP company.
- b. Bonsal American; an Oldcastle company.
- c. Bostik, Inc.
- d. C-Cure.
- e. Custom Building Products.
- f. Jamo Inc.
- g. Laticrete International, Inc.
- h. MAPEI Corporation.
- i. Southern Grouts & Mortars, Inc.
- j. Summitville Tiles, Inc.
- k. TEC; a subsidiary of H. B. Fuller Company.

2.5 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, white zinc alloy exposed-edge material.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. <TRIS-03>: Schluter – Reno TK, AETK 100.
 - b. <TRIS-06>: Schluter – Reno-V, AEVT100B20.
- C. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bonsal American, an Oldcastle company; Grout Sealer.
 - b. C-Cure; Penetrating Sealer 978.
 - c. MAPEI Corporation; KER 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.
 - d. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
 - e. TEC, a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone Grout Sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.
- E. Install crack isolation membrane over all control and other joints to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate. Joints that telegraph through tile will be subject to rejection.

3.3 INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors composed of tiles 8 by 8 inches or larger.
- 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. 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.
- E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Wall and Floor Tile: 3 mm.
 - 2. Glazed Wall Tile: 3 mm.
- F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 - Joint Sealants.
- H. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile. Refer to Drawings for additional information.
- I. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

END OF SECTION

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Acoustical panels and exposed suspension systems for ceilings.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Coordination Drawings: Drawn to scale and coordinating acoustical panel ceiling installation with hanger attachment to building structure and ceiling mounted items:
- C. Samples: For each exposed finish.
- D. LEED Submittal:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
 - 3. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured materials. Include statement indicating cost for each regionally manufactured material.
 - a. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.
- E. Product test reports.
- F. Research/evaluation reports.
- G. Maintenance data.

1.3 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- C. Preinstallation Conference: Conduct conference at Project site.

1.4 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Acoustical Ceiling Panels: Full-size panels equal to **2.0** percent of quantity installed.
 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANEL CEILINGS, GENERAL

- A. Acoustical Panel Standard: Comply with ASTM E 1264.
1. Recycled Content: Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 10 percent by weight.
- B. Metal Suspension System Standard: Comply with ASTM C 635.
1. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- 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: Bonded anchors fabricated from corrosion-resistant materials, 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.
 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to **10** times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

1. Size: Select wire diameter so its stress at 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 0.106-inch- diameter wire.
- E. Seismic perimeter stabilizer bars, seismic struts, and seismic clips.
- F. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that 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.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING <ACT-01, ACT-02>

- A. Basis-of-Design Product: Armstrong World Industries, Inc.; MESA, or a comparable product:
- B. Classification: Provide panels complying with ASTM E 1264 for type and form as follows:
 1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
- C. Color: White.
- D. LR: Not less than 0.85.
- E. NRC: Not less than 0.60.
- F. CAC: Not less than 35.
- G. Edge/Joint Detail: 15/16 inch Angled Tegral.
- H. Thickness: 3/4 inch.
- I. Modular Size: 24 by 24 inches.
- J. Axiom knife edge at ACT-02

2.3 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING <ACT-03>

- A. Basis-of-Design Product: Armstrong World Industries, Inc.; FINE FISSURED, or a comparable product :
- B. Classification: Provide panels complying with ASTM E 1264 for type and form as follows:
 1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
- C. Color: White.
- D. LR: Not less than 0.85.
- E. NRC: Not less than 0.55.

- F. CAC: Not less than 33.
- G. Edge/Joint Detail: 15/16 inch Square Lay-in.
- H. Thickness: 5/8 inch.
- I. Modular Size: 24 by 24 inches.

2.4 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING <ACT-05>

- A. Basis-of-Design Product: Armstrong World Industries, Inc.; FINE FISSURED
- B. Classification: Provide panels complying with ASTM E 1264 for type and form as follows:
 - 1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
- C. Color: Black.
- D. LR: Not less than 0.85.
- E. NRC: Not less than 0.55.
- F. CAC: Not less than 33.
- G. Edge/Joint Detail: 15/16 inch Square Lay-in.
- H. Thickness: 5/8 inch.
- I. Modular Size: 24 by 24 inches.

2.5 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING <ACT-06>

- A. Basis-of-Design Product: Armstrong World Industries, Inc.; Clean Room VL Unperforated, or a comparable product
- B. Classification: Provide panels complying with ASTM E 1264 for type and form as follows:
 - 1. Type and Form: Type IV; Form 2, Pattern E.
- C. Color: White.
- D. LR: Not less than 0.80.
- E. CAC: Not less than 40.
- F. Edge/Joint Detail: 15/16 inch Square Lay-in.
- G. Thickness: 5/8 inch.
- H. Modular Size: 24 by 24 inches.

2.6 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING <ACT-07>

- A. Basis-of-Design Product: Armstrong World Industries, Inc.; METAL WORKS Open Cell, or a comparable product
- B. Ceiling Panels
 - 1. Material: Aluminum
 - 2. Color: Custom RAL color to be selected by Architect.
 - 3. Paint: Post Production, Powder coated finish
 - 4. Panel Frame: continuous frame along perimeter of panel
 - 5. Each Field Panel to be accessible and full size
 - 6. Edge/Joint Detail: 9/16 inch Square Lay-in.
 - 7. Interior Cell Size: 8 inches.
 - 8. Modular Size: 24 by 24 inches.
- C. Panel Trim:
 - 1. Material: Aluminum
 - 2. Color: Custom color painted to match Open Cell Product.
 - 3. Paint: Field painted custom color after installation
 - 4. Basis of Design: Armstrong Axiom Classic Perimeter Trim; AX4STR

2.7 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- A. Basis-of-Design Products: Armstrong World Industries, Inc. as indicated on the finish legend.
- B. Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 15/16-inch-wide metal caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) type.
 - 3. Cap Material: Aluminum cold-rolled sheet.
 - 4. Cap Finish:
 - a. ACT - 1, 2,3 and 6: White,
 - b. ACT-5: Black
 - c. ACT-7: Match ceiling tile color
 - 5. Perimeter Trim: 7/8 inch hemmed angled molding

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and Cisca's "Ceiling Systems Handbook."

- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, refer to drawings for ceiling layout.
- C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices. 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.
 - 1. Do not support ceilings directly from permanent metal forms or floor deck; anchor into concrete slabs.
 - 2. Do not attach hangers to steel deck tabs or to steel roof deck.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit. Install cut edges of acoustical panels adjacent to wall, and finished panel edges toward room

3.2 METALWORK INSTALLATION

- A. Install MetalWorks Open Cell in accordance with manufacturer installation instruction, including cutting instructions and suspension installation.
- B. Coordinate panel layout with mechanical and electrical fixtures.

END OF SECTION

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Resilient base.
- B. Accessories

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For adhesives, including printed statement of VOC content.
- C. Samples: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Materials: Provide additional stock of 5% of rubber base <RB-01> same dye lot to Owner for storage upon completion of installation.

PART 2 - PRODUCTS**2.1 RESILIENT BASE <RB-01, RB-02, RB-03>****A. Resilient Base:**

1. Basis-of-Design Product: Subject to compliance with requirements, provide TightLock Carpet and Resilient Wall Base by Johnsonite, Inc., or a comparable product by one of the following:
 - a. Allstate Rubber Corp.; Stoler Industries.
 - b. Armstrong World Industries, Inc.
 - c. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - d. Endura Rubber Flooring; Division of Burke Industries, Inc.
 - e. Mondo Rubber International, Inc.
 - f. Musson, R. C. Rubber Co.
 - g. Nora Rubber Flooring; Freudenberg Building Systems, Inc.
 - h. Roppe Corporation, USA.
 - i. VPI, LLC; Floor Products Division.

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: Cove (base with toe).

C. Resilient Base Description:

1. Minimum Thickness: 0.080 inch.
2. Height: 4 inches.
3. Lengths: Coils in manufacturer's standard length.
4. Outside Corners: Preformed.
5. Inside Corners: Job formed or preformed.
6. Finish: As selected by Architect from manufacturer's full range.
7. Colors and Patterns:
 - a. RB-01: Custom Color.
 - b. RB-02 and RB-03: Standard Color as indicated on finish legend

2.2 RESILIENT MOLDING ACCESSORIES**A. Transitions**

1. Terrazzo to Linoleum Flooring <TRS-04>
 - a. Basis of Design: Johnsonite SLT 20 H
 - b. 1/4 inch to .080" material
2. Carpet to Concrete <TRS-07>

- a. Basis of Design: Johnsonite RRS-20B
 - b. .080" material to floor
 - c. 1-1/8 inch wide
- 3. Carpet to Linoleum Flooring <TRS-09>
 - a. Basis of Design: Johnsonite SLT 20 H
 - b. 1/4 inch to .080" material
- B. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- C. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Cove Base Adhesives: Not more than 50 g/L.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.

3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Cover resilient products until Substantial Completion.

END OF SECTION

SECTION 09 65 16 - RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Linoleum sheet flooring.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Product Data for Credit IEQ 4.1: For adhesives, including printed statement of VOC content.
- C. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
- D. Samples: In manufacturer's standard size, but not less than 6-by-9-inch sections of each different color and pattern of floor covering required.
- E. Maintenance data.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor coverings.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Close spaces to traffic during floor covering installation.

- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install floor coverings after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 LINOLEUM SHEET FLOORING <LF-01>

- A. Basis of Design Products: Subject to compliance with requirements, provide Marmorette with NATURCote by Armstrong World Industries.
- B. Sheet Flooring: ASTM F 2034, Type I, linoleum sheet with backing.
 - 1. Roll Size: In manufacturer's standard length.
- C. Seaming Method: Heat welded.
- D. Thickness: As scheduled or selected by Architect.
- E. Colors: As indicated on finish legend.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor covering and substrate conditions indicated.
 - 1. Use adhesives that have a VOC content of not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.
- D. Heat-Welding Bead: Solid-strand product of linoleum floor covering manufacturer.
 - 1. As selected by Architect from Manufacturer's full range.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.

- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform 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. in 24 hours.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor coverings until they are same temperature as space where they are to be installed.
 - 1. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.2 LINOLEUM SHEET FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor coverings.
- B. Unroll floor coverings and allow them to stabilize before cutting and fitting.
- C. Lay out floor coverings as follows:
 - 1. Maintain uniformity of floor covering direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.
 - 3. Match edges of floor coverings for color shading at seams.
 - 4. Avoid cross seams.
 - 5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).
- D. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.
- E. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

- F. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor coverings 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.

3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor covering.
- B. Perform the following operations immediately after completing floor covering installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Floor Polish: Remove soil, visible adhesive and surface blemishes from floor covering before applying liquid floor polish.
 - 1. Apply two coats.
- D. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- E. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover linoleum floor coverings until Substantial Completion.

END OF SECTION

SECTION 09 66 23 - RESINOUS MATRIX TERRAZZO FLOORING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Thin-set epoxy-resin terrazzo flooring and base.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For marble chips, aggregates, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement that indicates cost for each product having recycled content.
 - 2. Product Data for Credit IEQ 4.1: For adhesives, including printed statement of VOC content.
- C. Shop Drawings: Include terrazzo installation requirements. Include dimensioned plans, elevations, sections, component details, and attachments to other work.
- D. Samples: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected.
- E. Installer certificates.
- F. Qualification data.
- G. Material certificates.
- H. Maintenance data.

1.3 QUALITY ASSURANCE

- A. Product Listing: Matrix resin and chips to be listed on NTMA approved supplier list.
- B. Installer Qualifications: A qualified installer who is acceptable to terrazzo manufacturer to install manufacturer's products.
 - 1. Engage an installer who is certified in writing by terrazzo manufacturer as qualified to install manufacturer's products.
 - 2. Engage an installer who is a contractor member of NTMA.

- C. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
- E. Preinstallation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.
- B. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- C. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- D. Control and collect dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.
 - 1. Provide dustproof partitions and temporary enclosures to limit dust migration and to isolate areas from noise.

PART 2 - PRODUCTS

2.1 EPOXY-RESIN TERRAZZO

- A. Products: Subject to compliance with requirements, provide products indicated on the drawings or one of the following:
 - 1. Key Resin Company; Key Epoxy Terrazzo.
 - 2. Master Terrazzo Technologies LLC; Morricite.
 - 3. Quadrant Chemical Corporation; Quadset Epoxy Terrazzo.
 - 4. TEC Specialty Construction Brands, Inc.; Tuff-Lite Epoxy Terrazzo.
 - 5. Terrazzo & Marble Supply Companies; Terroxy Resin Systems.
- B. Materials:
 - 1. Primer: Manufacturer's product recommended for substrate and use indicated.
 - 2. Epoxy-Resin Matrix: Manufacturer's standard recommended for use indicated and in color required for mix indicated.
 - a. Physical Properties without Marble Chips
 - 1) Hardness: 60 to 85 per ASTM D 2240, Shore D.

- 2) Minimum Tensile Strength: 3000 psi per ASTM D 638 for a 2-inch specimen made using a "C" die per ASTM D 412.
- 3) Minimum Compressive Strength: 10,000 psi per ASTM D 695, Specimen B cylinder.
- 4) Chemical Resistance: No deleterious effects by contaminants listed below after seven-day immersion at room temperature per ASTM D 1308.
 - a) Distilled water.
 - b) Mineral water.
 - c) Isopropanol.
 - d) Ethanol.
 - e) 0.025 percent detergent solution.
 - f) 1.0 percent soap solution.
 - g) 10 percent sodium hydroxide.
 - h) 10 percent hydrochloric acid.
 - i) 30 percent sulfuric acid.
 - j) 5 percent acetic acid.
- b. Physical Properties with Marble Chips: For resin blended with Georgia white marble, ground, grouted, and cured per requirements in NTMA's "Terrazzo Specifications and Design Guide," comply with the following:
 - 1) Flammability: Self-extinguishing, maximum extent of burning 0.25 inch per ASTM D 635.
 - 2) Thermal Coefficient of Linear Expansion: 0.0025 inch/inch per deg F for temperature range of minus 12 to plus 140 deg F per ASTM D 696.
3. Marble Chips: Complying with NTMA gradation standards for mix indicated and containing no deleterious or foreign matter.
 - a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131.
 - b. 24-Hour Absorption Rate: Less than 0.75 percent.
 - c. Dust Content: Less than 1.0 percent by weight.
 - d. Recycled Content: Provide products with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
4. Finishing Grout: Resin based.
- C. Terrazzo: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and marble-chip proportions and mixing.
 1. Custom Mix Color and Pattern: Match Architect's samples

2.2 STRIP MATERIALS

- A. Thin-Set Divider Strips: L-type angle or T-type, 1/4 inch deep.
 1. Material: Aluminum.

2. Top Width: 1/8 inch.
- B. Decorative Metal Strips:
1. <MTLS-01>: 1/4 inch decorative strips as indicated on finish legend.
 2. <MTLS-02>: 1 inch decorative strip as indicated on finish legend.
- C. Control-Joint Strips: Separate, double L-type angles, positioned back to back, that match material, thickness, and color of divider strips and in depth required for topping thickness indicated.
- D. Accessory Strips: Match divider strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
1. Edge-bead strips for exposed edges of terrazzo.

2.3 CRACK ISOLATION MEMBRANE

- A. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
1. Products: Subject to compliance with requirements, provide one of the following
 - a. Bostik, Inc.; Durabond D-222.
 - b. C-Cure; CureLastic 949.
 - c. Custom Building Products; Redgard Waterproofing and Crack Prevention Membrane
 - d. Mer-Kote Products, Inc.; Fracture-Guard 5000.
 - e. TEC, a subsidiary of H. B. Fuller Company; HydraFlex - Waterproofing Crack Isolation Membrane.

2.4 MISCELLANEOUS ACCESSORIES

- A. Strip Adhesive: Epoxy-resin adhesive recommended by adhesive manufacturer for this use and acceptable to terrazzo manufacturer.
1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Anchoring Devices:
1. Provide mechanical anchoring devices for strip materials as required for secure attachment to substrate.
- C. Patching and Fill Material: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- D. Joint Compound: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.

- E. Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.
- F. Sealer: Slip- and stain-resistant penetrating-type sealer that is chemically neutral with pH factor between 7 and 10; does not affect color or physical properties of terrazzo; is recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.
- B. Concrete Slabs:
 - 1. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written recommendations.
 - c. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.
 - 2. Verify that concrete substrates are visibly dry and free of moisture.
 - 3. Moisture Testing:
 - a. Test for moisture by anhydrous calcium chloride method 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. in 24 hours.
 - b. Test for moisture by relative humidity probe and digital meter method according to ASTM F 2170. Proceed with installation only after substrates have a maximum relative-humidity-measurement reading of 70 to 75 percent in 24 hours.
 - c. Test for moisture content by method recommended in writing by terrazzo manufacturer. Proceed with installation only after substrates pass testing.
- C. Protect other work from dust generated by grinding operations. Control dust to prevent air pollution and comply with environmental protection regulations.
 - 1. Erect and maintain temporary enclosures and other suitable methods to limit dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

- D. Install crack isolation membrane over control joints to comply with manufacturer's written instructions and as detailed.
- E. Installation of terrazzo indicates acceptance of surfaces and conditions.

3.2 EPOXY-RESIN TERRAZZO INSTALLATION

- A. General:
 - 1. Comply with NTMA's written recommendations for terrazzo and accessory installation.
 - 2. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions and NTMA's "Terrazzo Specifications and Design Guide."
 - 3. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet; noncumulative.
 - 4. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
 - 5. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.
- B. Thickness: 1/4 inch nominal.
- C. Flexible Reinforcing Membrane:
 - 1. Prepare and prefill substrate cracks with membrane material.
 - 2. Install membrane to produce full substrate coverage in areas to receive terrazzo.
 - 3. Reinforce membrane with fiberglass scrim.
 - 4. Prepare membrane according to manufacturer's written instructions before applying substrate primer.
- D. Primer: Apply to terrazzo substrates according to manufacturer's written instructions.
- E. Strip Materials:
 - 1. Divider and Control-Joint Strips:
 - a. Locate divider strips in locations indicated.
 - b. Install control-joint strips back to back directly above concrete-slab control joints.
 - c. Install control-joint strips with 1/4-inch gap between strips, and install sealant in gap.
 - d. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
 - 2. Accessory Strips: Install accessory strips as required to provide a complete installation.
 - 3. Abrasive Strips: Install with surface of abrasive strip positioned 1/32 inch higher than terrazzo surface.

- F. Fine Grinding: Grind with stones 800 grit or finer until all grout is removed from surface. Repeat rough grinding, grout coat, and fine grinding if large voids exist after initial fine grinding. Produce surface with a minimum of 70 percent aggregate exposure.
- G. Repair: Remove and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.3 CLEANING AND PROTECTION

- A. Cleaning:
 - 1. Remove grinding dust from installation and adjacent areas.
 - 2. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow to dry thoroughly.
- B. Sealing:
 - 1. Seal surfaces according to NTMA's written recommendations.
 - 2. Apply sealer according to sealer manufacturer's written instructions.
- C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 09 67 23 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Resinous flooring

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data, installation instructions, and general recommendations for each resinous flooring material required. Include certification indicating compliance of materials with requirements.
- B. Samples: 4-inch square samples of each type of resinous flooring required, applied to a rigid backing, in color and finish indicated.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who is acceptable to resinous flooring manufacturer to install manufacturer's products.
- B. Mockups: Build mockup to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
- C. Preinstallation Conference: Conduct conference at Project site.
- D. ISO 9002: All materials, including primers, resins, curing agents, finish coats, aggregates and sealants are manufactured and tested under an ISO 9002 registered quality system.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting installation.
- B. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring.

PART 2 - PRODUCTS**2.1 EPOXY FLOORING**

- A. Basis of Design: Stonclad GR coated with Stonkote GS4 as manufactured by Stonhard, Inc., <EP-01>
- B. Description: Nominal 1/4" thick assembly comprised of a penetrating, moisture tolerant, two-component epoxy primer, a high performance, four-component mortar consisting of epoxy resin, curing agent, selected, graded aggregates blended with 30% recycled glass and inorganic pigments and a two-component, 100% solids, general service, epoxy coating.
- C. Physical Properties:
 - 1. Compressive Strength: 10,000 psi per ASTM C-579
 - 2. Tensile Strength: 1,750 psi per ASTM C-307
 - 3. Flexural Strength 4,000 psi per ASTM C-580
 - 4. Flexural Modulus of Elasticity 2.0×10^6 psi per ASTM C-580
 - 5. Hardness 85-90 per (ASTM D-2240/Shore D)
 - 6. Bond Strength >400 psi per ASTM D-7234 (100% concrete failure)
 - 7. Impact Resistance > 160 in. lbs. per ASTM D-2794
 - 8. Abrasion Resistance 0.1 gm max. weight loss per ASTM D-4060, Taber Abrader CS-17 wheel
 - 9. Coefficient of Friction (Dry) 0.83 per ASTM D-2047
 - 10. Slip Resistance Index (Wet) 0.66
 - 11. Flammability Class 1 per ASTM D-648
 - 12. Water Absorption 0.2% per ASTM C-413
 - 13. Cure Rate allow 8 hours for foot traffic at 77 deg F 24 hours for normal operations
 - 14. VOC Content 0 g/L per ASTM D-2369

2.2 ACCESSORY PRODUCTS

- A. Joint Sealants: Type produced by manufacturer of resinous flooring system for type of service and joint conditions indicated.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Substrate: Concrete preparation shall be by mechanical means and include use of a scabbler, scarifier or shot blast machine for removal of bond inhibiting materials such as curing compounds or laitance.

3.2 APPLICATION

- A. General: Apply each component of resinous flooring system in compliance with manufacturer's directions to produce a uniform monolithic wearing surface of thickness

indicated, uninterrupted except at divider strips, sawn joints or other types of joints (if any), indicated or required.

- B. Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates. Coordinate timing of primer application with application of troweled mortar to ensure optimum adhesion between resinous flooring materials and substrate.
- C. Troweled Mortar: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate using manufacturer's specially designed screed box adjusted to manufacturer's recommended height. Hand trowel apply mixed material over freshly primed substrate using stainless steel finishing trowels.
- D. Coating: Remove any surface imperfections by lightly abrading and vacuuming the floor surface. Mix, squeegee apply and backroll coating with strict adherence to manufacturer's installation procedures and coverage rates.

3.3 CURING, PROTECTION AND CLEANING

- A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.
- B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.
- C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

END OF SECTION

SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Modular, carpet tile.

1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Show the following:
 - 1. Carpet tile type, color, and dye lot.
 - 2. Direction of Pattern
 - 3. Insets and borders.
 - 4. Edge, transition, and other accessory strips.
 - 5. Transition details to other flooring materials.
- C. Samples: For each color and texture required.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch- long Samples.
- D. LEED Submittal:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
 - 3. Product Data for Credit IEQ 4.3:
 - a. For carpet tile, documentation indicating compliance with testing and product requirements of Carpet and Rug Institute's "Green Label Plus" program.
 - b. For installation adhesive, including printed statement of VOC content.
- E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- F. Maintenance data.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Mockups: Before installing carpet tile, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

1.5 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.6 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 CARPET TILE <CPT-01, CPT-02>

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 1. Tandus Flooring, Inc., Tanka II 02499.
 - a. Color: As indicated on finish legend.
 - b. Fiber System: Dynex Nylon
 - c. Pile Characteristic: Patterned Loop
 - d. Dye Method: Yarn Dyed
 - e. Pile Thickness: 0.187 inches
 - f. Stitches per Inch: 9.2
 - g. Gage: 5/64
 - h. Face Weight: 20 oz/sq yd
 - i. Backing System: ER3 Modular.
 - j. Size: 24 by 24 inches.
 - k. Applied Soil-Resistance Treatment: Manufacturer's Standard Method.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
 1. VOC Limits: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer . Quarter turned if not specified by manufacturer.

- C. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- D. Install pattern parallel to walls and borders.

END OF SECTION

SECTION 09 72 00 – WALL COVERINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fiberglass reinforced wall panels.
- B. Acoustical Wall Carpeting.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for each exposed product and for each color and texture specified.
- C. Certification Data: Required.
- D. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
 - 3. Product Data for Credit IEQ 4.1: For adhesives, including printed statement of VOC content.
 - 4. Product Data for Credit IEQ 4.2: For paints and coatings, including printed statement of VOC content.
 - 5. Laboratory Test Reports for Credit IEQ 4.1: For wall covering systems, documentation indicating that products 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."

1.3 STORAGE

- A. All products should be stored indoors. When outside storage is necessary, cover and protect from the weather and exposure to sunlight. Prior to installation, panels should be re-stacked on solid flat surface to minimize package distortion.

1.4 QUALITY ASSURANCE

- A. Fiberglass reinforced wall panels: Comply with N.S.F. governing codes and regulations. Provide products suitable for food preparation areas and from acceptable manufacturers, which have been in satisfactory use in similar service for three years.

PART 2 - PRODUCTS**2.1 PRODUCTS**

- A. Fiberglass reinforced wall panels (FRP):
1. Basis-of-Design Product: FRP P100 Wall Panels with pre-drilled holes by Marlite.
 2. Subject to compliance with requirements, provide the a comparable product by one of the following:
 - a. Kemlite 'Fire X Glasbord'
 - b. Structoglas by Sequentia.
 3. Materials: 0.09 inch thick fiberglass reinforced plastic panels with leather or pebble grain finish. Provide in 48 inch x 120 inch panels. Material shall meet the following criteria:
 - a. Flame Spread: 90
 - b. Smoke Developed: 190
 - c. Flexural Strength: 1.7×10^4 psi
 - d. Flexural Modulus: 6.0×10^5 psi
 - e. Tensile Strength: 8.0×10^3 psi
 - f. Tensile Modulus: 9.43×10^3 psi
 - g. Barcol Hardness: 40
 - h. Impact Strength: 7.0 izod
 - i. Expansion Coefficient: 1.6×10^{-5} in./in./F°
 - j. Water Absorption: 0.17%
 - k. Color: White.
- B. Acoustical Wall Carpet <FAB-01>:
1. Basis-of-Design: Hytex Decorative Textiles "Ozite Rib" by Hytex Industries.
 2. Materials:
 - a. Face Weight: 23 ounces.
 - b. Width: 54 inches
 - c. Fiber: Post-Consumer Recycled solution Dyed Polyester.
 - d. Backing: Fusible.
 - e. Flame Spread: 15
 - f. Smoke Developed: 15
- C. Vinyl Wall Covering <VWC-01, VWC-02, VWC-03>:
1. Basis-of-Design: Print International.

2. Prints: Custom print as indicated on finish legend.
3. Type II Wall Covering; Medium-Duty.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fiberglass reinforced wall panels:

1. Panels to be installed horizontally with trim and accessory trim.
2. Take field measurements prior to fabrication where practical. Do not delay job progress.
3. Subsurface must be free of debris, dirt, dust or grease.
4. Install materials and systems for the approval of Local Health officials by adhesive method utilizing vinyl moldings and sealant at all joints in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Do not install if substrate is uneven or inadequately prepared. Coordinate with work of other sections. Provide for expansions at top, bottom, and at panel joints. Caulk all panel joints, corners and perimeter edges with silicone type sealant.
5. Adjust, clean, and touch-up all system components.

B. Acoustical Wall Carpeting:

1. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.
2. Install seams vertical and plumb at least 6 inches from outside corners and 6 inches from inside corners unless a change of pattern or color exists at corner.
3. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.
4. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

END OF SECTION

SECTION 09 83 16 – ACOUSTICAL CEILING COATING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior acoustical plaster ceiling finish.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit EQ 4.1: For sealants and adhesives, documentation including printed statement of VOC content.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Installer Qualifications: Submit certificate showing installer has completed manufacturer's training course.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be trained and certified by manufacturer. New installers to have a manufacturer's authorized technical representative onsite to assist with the installation.
- B. Single Source Responsibility: Provide factory formulated materials produced by a single manufacturer.

1.4 DELIVERY STORAGE AND HANDLING

- A. Deliver materials to project site in original, unopened packages, and store them in a fully enclosed space where they will be protected against damage from moisture. Protect materials from freezing.
- B. Inspect materials upon delivery and immediately report to any damaged or defective goods.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: do not install product until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature is above 50 degrees F. Ensure that the building is ventilated to assist with the drying process if the HVAC is not operational.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Fellert Ecooustic as distributed by Fellert USA, Inc.; 402-896-2005 www.fellertna.com.
 - 1. Products: Fellert Ecooustic.

2.2 PERFORMANCE REQUIREMENTS

- A. Noise reductions Coefficient: NRC 0.80 as per ASTM C423 Test Mounting Type A. Test results with any air gap between the absorptive panels and test frame assembly are not permissible.
- B. Flame Spread: Class A with a flame spread and smoke development of less than 25 as per ASTM E84.
- C. Light Reflectance: Minimum 0.83 in accordance with ASTM E1477.
- D. VOC content: Zero, when tested in accordance with ASTM D3960.
- E. Mold Specification: Meets the requirements of ASTM D3273 and ASTM D3274.
- F. Internal Stress rating: Minimum 2.3 when tested in accordance with ASTM D6991.
- G. Compressive Strength: Minimum 152 psi in accordance with ASTM E761.
- H. Density: Minimum 1.83 lbs/ft when tested in accordance with ASTM E605.

2.3 MATERIALS

- A. Plaster system: Provide manufacturer's complete system of materials:
 - 1. Fiberglass Board: 1-1/2 inch, 6 pound density sound absorbing fiberglass board.
 - 2. Primer: Manufacturer's recommended drywall primer.
 - 3. Plaster Mix: Sound absorbing plaster that is made from cotton fiber and perlite.
 - a. Thickness: Total plaster thickness 1/8 inch.
 - b. Finish: Ultra (smooth) to match architect's approved sample.
 - c. Color: Custom color, as selected by Architect
 - 4. Plaster Accessories:
 - a. Trim: Manufacturer's standard extruded plastic "C" channel.
 - b. Adhesive: Cementitious adhesive for attaching fiberglass board to substrate.
- B. Accessories: Use manufacturer's recommended tools and accessories, including spray machines, zinc screws, self-adhesive mesh tape, sandpaper, paddles, and trowels.

- C. Water: Clean, potable, and free of mineral or organic matter.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that existing substrates are acceptable before starting work. Do not begin work of this section until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instruction for substrate preparation.
 - 1. Do not prime, fill, or tape any joints or holes in gypsum board surfaces when installing plaster over fiberglass board.
 - 2. Verify that any previously painted surfaces are clean, sound, and secure to the substrate.
 - 3. Protect adjacent surfaces.
- B. Secure "C" Channel to perimeter of area to be plastered.
- C. Attach fiberglass board to wall substrate using adhesive, allow to dry for 24 hours minimum.
- D. Install mesh tape over primed surfaces at fiberglass board joints and locations where "C" Channel has been installed. Allow to dry.
- E. Sand joints, using vacuum sander, for smooth, even joints.

3.3 INSTALLATION

- A. General: Apply system per manufacturer's installation guide. Apply in accordance with ASTM C1396
- B. Apply base layers and finish coat using spray machine. Apply two base layers, then trowel each surface.
- C. Allow each layer to dry, before starting the next layer, approximately 2 to 5 days for each layer.
- D. Lightly sand each base layer.
- E. Apply finish coat, trowel to match approved sample.

END OF SECTION

SECTION 09 84 13 - FIXED SOUND-ABSORPTIVE PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Spline -mounted acoustical wall panels.

1.2 SUBMITTALS

- A. Product Data: For each type of panel edge, core material, and mounting indicated.
- B. Shop Drawings: For acoustical wall panels. Include fabric panel direction, mounting devices and details.
 - 1. Field Measurements: Verify locations of acoustical wall panels by field measurements before fabrication and indicate measurements on Shop Drawings.
- C. Coordination Drawings: Show intersections with adjacent work.
- D. Samples: For each fabric and sample panels.
- E. LEED Submittal:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
 - 2. Product Data for Credit IEQ 4.1: For installation adhesives, documentation including printed statement of VOC content and chemical components.
 - 3. Product Data for Credit IEQ 4.4: For composite wood products used in sound-absorbing wall units, documentation indicating that product contains no urea formaldehyde..
- F. Maintenance data.

1.3 QUALITY ASSURANCE

- A. 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:
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.

- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.
 - 1. Install mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
- C. Preinstallation Conference: Conduct conference at Project site.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of acoustical wall panels that fail in performance, materials, or workmanship within specified warranty period.
 - 1. Failure in performance includes, but is not limited to, acoustical performance.
 - 2. Failures in materials include, but are not limited to, fabric sagging, distorting, or releasing from panel edge; or warping of core.
 - 3. Warranty Period: Two years from date of Substantial Completion.

1.5 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fabric: For each fabric, color, and pattern installed, provide length equal to 10 percent of amount installed, but no fewer than 10 yards.
 - 2. Acoustical Wall Panel Mounting Devices: Full-size units equal to 5 percent of amount installed, but no fewer than 5 attachment devices.

PART 2 - PRODUCTS

2.1 CORE MATERIALS

- A. Mineral-Fiber Board (MDF) Multi density fiberglass semi rigid board <AWP-01>:
 - 1. Density: 16 pcf .
 - 2. Maximum flame-spread and smoke-developed indexes of 15 and 5, respectively.
- B. Glass Fiber board: Semi-rigid fiberglass board<AWP-02,-03,-04,-05>
 - 1. Density: 6 pcf.
 - 2. Maximum flame-spread and smoke-developed indexes of 15 and 5, respectively.

2.2 SPLINE-MOUNTED ACOUSTICAL WALL PANELS WITH PERFORATED MINERAL-FIBER BOARD CORE OR GLASS-FIBER BOARD CORE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide NovaWall, 1-inch Deep Classic Stretched Fabric Panel System or a comparable product by one of the following:
 - 1. FabriTrak
 - 2. Whisperwall
 - 3. Mid Atlantic Specialties
- B. Panel Construction: Manufacturer's standard panel construction consisting of facing material laminated to front face of a perforated, water-felted, mineral-fiber board or glass fiber core; with long edges kerfed and rabbeted to receive splines.
- C. Facing Material: Fabric from same dye lot; color and pattern as indicated on Finish Legend.
 - 1. Applied Treatments: Stain resistance.
- D. Nominal Overall Panel Thickness: 1 inch.
- E. NRC: NRC 0.80 per ASTM C423 for a 1-inch system.
- F. Panel Width: As indicated on Drawings.
- G. Panel Height: Fabricated from units in height as indicated on Drawings; mounting height as indicated on Drawings.
- H. Panel Edge: Core self-edge.
- I. Panel Short Edge Detail: Square.

2.3 FABRICATION

- A. Fabric Facing: Stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other foreign matter. Applied with visible surfaces fully covered.
- B. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:
 - 1. Thickness.
 - 2. Edge straightness.
 - 3. Overall length and width.
 - 4. Squareness from corner to corner.
- C. Spline-Mounting Accessories: Manufacturer's standard concealed, extruded-aluminum or plastic connecting splines designed and fabricated for screw attachment to walls, with other moldings and trim for interior and exterior corners, leveling and base support with factory-applied finish on exposed items.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install acoustical wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
 - 1. Perimeter track must be field cut and tucked into track system while fabric to be custom fit and stretched in field.
 - 2. Cut units to be at least 50 percent of unit width, with facing material extended over cut edge to match uncut edge. Scribe acoustical wall panels to fit adjacent work. Butt joints tightly.
- B. Anchor panels securely to supporting substrate.
- C. Match and level fabric pattern and grain among adjacent panels.
- D. Installation Tolerances: As follows:
 - 1. Variation from Level and Plumb: Plus or minus 1/16 inch.
 - 2. Variation of Panel Joints from Hairline: Not more than 1/16 inch wide.
- E. Clip loose threads; remove pills and extraneous materials.
- F. Clean panels with fabric facing, on completion of installation, to remove dust and other foreign materials according to manufacturer's written instructions.
- G. Replace acoustical wall panels that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

SECTION 09 90 00 - PAINTING AND COATING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation and the application of paint and coating systems on the following exterior and interior substrates.
 - 1. Concrete.
 - 2. Steel.
 - 3. Wood.
 - 4. Gypsum board.

1.2 SUBMITTALS

- A. Submittals – General: When preparing submittals for Interior items listed on the Finished Legend clearly identify on submittal the material “item” identifier. (i.e. “MTL-02”, “PLAM-01”, “PLAM-02”, etc.)
- B. Product Data: For each type of product. Include preparation requirements and application instructions.
- C. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.2: For paints and coatings, including printed statement of VOC content.
- D. Provide labeled samples of each paint and coating specified, refer to Finish Legend for colors.
- E. Samples: Provide labeled samples for each type of paint and coating specified, refer to Finish Legend for colors.

1.3 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. of each material and color applied.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Indicated products by Glidden Professional/Devoe.
 1. Other manufacturers offering products of comparable quality include:
 - a. Sherwin - Williams
 - b. Benjamin Moore
 - c. Pittsburg Paint
 - d. ICI/Dulux
- B. Colors: As indicated on Drawings.

2.2 PAINT, GENERAL

- A. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 150 g/L.
 3. Dry-Fog Coatings: 400 g/L.
 4. Primers, Sealers, and Undercoaters: 200 g/L.
 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 7. Pretreatment Wash Primers: 420 g/L.
 8. Floor Coatings: 100 g/L.
 9. Shellacs, Clear: 730 g/L.
 10. Shellacs, Pigmented: 550 g/L.

2.3 PRIMERS/SEALERS

- A. Galvanized Steel Substrate – Exterior/Interior: Factory-formulated acrylic primer for exterior application.
 - 1. Glidden/Devoe; Devflex 4020PF Direct to Metal Primer.
- B. Steel substrate under Epoxy – Exterior: Factory formulated primer for exterior applications.
 - 1. Glidden/Devoe; Cathacoat 313 Organic Zinc-Rich Epoxy Primer.
- C. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
 - 1. Glidden “Lifemaster” 9116.
- D. Interior Gypsum Board Primer Under Wall Coverings: Factory-formulated latex-based primer for interior application.
 - 1. Glidden Professional “Gripper” 3210: Applied at a dry film thickness of not less than 1.2 mils.
- E. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive acrylic-based metal primer.
 - 1. Glidden Professional /Devoe; Devflex 4020 Direct to Metal Primer.
- F. Interior Wood Primer: Factory-formulated latex based primer for interior applications.
 - 1. Glidden Professional; “Lifemaster” 9116.

2.4 INDUSTRIAL COATINGS

- A. Undercoat, High Build Epoxy, Exterior:
 - 1. Glidden Professional/Devoe Bar Rust 231.
- B. Topcoat, Polyurethane, Exterior:
 - 1. Glidden Professional/Devoe “Devthane” 379.
- C. Topcoat, Acrylic Enamel, Exterior/Interior:
 - 1. Glidden Professional/Devoe “Devflex” 4216HP.

2.5 WATER-BASED PAINTS

- A. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.
 - 1. Glidden Professional “Lifemaster 9000” Series.

- B. Interior Satin Acrylic Enamel: Factory-formulated satin acrylic-latex enamel for interior trim and door applications.

- 1. Glidden Professional "Lifemaster 9000" Series.

2.6 "EPOXY"

- 1. Glidden Professional/Diamond 450 No VOC Interior Paint

2.7 DRY FOG/FALL COATINGS

- A. Dry Fall, Acrylic, Flat:

- 1. Glidden Professional/Devoe "Uni-Grip" 1280.

2.8 CONCRETE FLOOR SEALER

- A. Lithium silicate floor hardener:

- 1. Prosoco, Inc. "Consolideck LS Guard".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Wood: 15 percent.
 - 3. Gypsum Board: 12 percent.
- 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. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.3 APPLICATION

- A. 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 CLEANING AND PROTECTION

- A. 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.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
 - 1. Structural steel Water-Based Light Industrial Coating System:
 - a. Prime Coat: Primer, applied under Section 05 12 00 – Structural Steel.
 - b. Intermediate Coat: Industrial High Build Epoxy.
 - c. Top Coat – at exposed locations only: Industrial Aliphatic Urethane
 - 2. Industrial Acrylic Latex over Acrylic Primer System – Hollow Metal Doors and Frames:
 - a. Prime Coat: Primer, galvanized, Acrylic.
 - b. Intermediate Coat: Industrial Acrylic Latex, matching topcoat.
 - c. Topcoat: Industrial Acrylic Latex, exterior, semi-gloss.

B. Galvanized-Metal Substrates:

1. Industrial Acrylic Latex over Acrylic Primer System:
 - a. Prime Coat: Primer, galvanized, Acrylic.
 - b. Intermediate Coat: Industrial Acrylic Latex, exterior, matching topcoat.
 - c. Topcoat: Industrial Acrylic Latex, exterior, semi-gloss.

3.6 INTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Industrial Acrylic Latex over Acrylic Primer System:
 - a. Prime Coat: Primer, galvanized, Acrylic.
 - b. Intermediate Coat: Industrial Acrylic Latex, exterior, matching topcoat.
 - c. Topcoat: Industrial Acrylic Latex, exterior, semi-gloss.
2. Water-Based Dry-Fall System - Ceilings:
 - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal or primer, latex, quick dry, for metal.
 - b. Topcoat: Dry fall, latex, flat.

B. Gypsum Board :

1. Latex System:
 - a. Prime Coat: Primer sealer, latex, interior.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, refer to Interior finish legend for gloss.
2. Epoxy System:
 - a. Prime Coat: Primer sealer, latex, interior.
 - b. Intermediate Coat: Epoxy, interior, matching topcoat.
 - c. Topcoat: Epoxy, interior, matching topcoat.

C. Concrete Floor Substrates:

1. Lithium Silicate System:
 - a. 2 coats floor sealer.

END OF SECTION

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Code Required Panel Signage
- B. Wall Mural Graphic: Custom printed graphics.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured materials. Include statement indicating cost for each regionally manufactured material.
 - a. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.
 - 2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
 - 3. Laboratory Test Reports for Credit IEQ 4.1: For adhesives, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: For signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- D. Samples: For each exposed product and for each color and texture specified.
- E. Sign Schedule: Use same designations as indicated in sign schedule.
- F. Sample warranty.
- G. Maintenance data.

1.3 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- B. Special Warranty – Graphic Mural: Manufacturer agrees to repair or replace components of the mural that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Seven (7) years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 PANEL SIGNS, GENERAL**

- A. Regional Materials: Panel signs shall be manufactured within 500 miles of Project site.

2.2 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, ICC A117.1 and State of North Carolina Building Code for signs.

2.3 PANEL SIGNS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Advance Corporation; Braille-Tac Division.
 - 2. ASE, Inc.
 - 3. ASI Sign Systems, Inc.
 - 4. Best Sign Systems Inc.
 - 5. InPro Corporation.
 - 6. Mohawk Sign Systems.
 - 7. Poblocki Sign Company, LLC.
 - 8. Supersine Company (The); Division of Stamp-Rite, Inc.
- B. Code required signage: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
 - a. Surface-Applied Text and Graphics: Applied 0.32 inch raised text and graphics, text and graphic color as selected by Architect from manufacturer's full color line.
 - b. Braille: Provide Grade II Braille on all signage.
 - c. Graphics: As indicated in Sign Schedule.

- d. Text: Refer to Sign Schedule.
- 2. Frame: Entire perimeter.
 - a. Material: Injection molded.
 - b. Profile: Square.
 - c. Corner Condition in Elevation: Square.
 - d. Finish and Color: Contrasting custom color.
- 3. Mounting: Surface mounted to wall with two-face tape.

2.4 GRAPHIC MURAL

- A. Basis-of-Design Product: Subject to compliance with requirements, provide “DigiBrick” by Fetch Graphics; www.fetchgraphics.com, 888-933-8249.
- B. Vinyl Film: UV-resistant vinyl film, with pressure-sensitive, permanent adhesive on back; high resolution images as indicated as indicated on Drawings and suitable for exterior applications.
- C. Digital file of artwork content to be provided by Owner.
- D. Substrate Sealer: Clear sealer as recommended by manufacturer.

2.5 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 manufacturer and with a VOC content of 70 g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

2.6 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 2. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Prepare masonry surfaces to receive Graphic Mural in accordance with manufacturer's recommendations. Apply recommended sealer in accordance with sealer manufacturer dry film thickness. Apply sealer to surfaces scheduled to receive mural and allow sealer to dry.

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. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Mounting Methods:
1. 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.
- C. Remove temporary protective coverings and strippable films as signs are installed.

3.3 SIGN SCHEDULE

- A. Provide code required signage at the following rooms; verify room numbers with Owner:
- B. All signs shall be 8 by 8 inches.

Room Number	Room Name and Sign Text	International Symbol of Accessibility	Comments
105	STORAGE		
110	WOMEN	Yes	
111	FAMILY	Yes	
112	MEN	Yes	
124	JANITOR		
127	ELECTRICAL		
128	TELECOM		
134	STORAGE		
140	SWITCHGEAR		
141	GENERATOR		
142	CABLE		

Room Number	Room Name	International Symbol of Accessibility	Comments
143	STORAGE		
144	COLLECTIONS STORAGE		Provide one sign at each entrance.
149	TELECOM		
153	ELECTRICAL		
154	JANITOR		
158	WOMEN	Yes	
159	MEN	Yes	
201	MECHANICAL		Provide at entrance to stair on 1 st floor.

END OF SECTION

SECTION 10 21 13 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Solid-polymer toilet compartments configured as toilet enclosures and urinal screens.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4. : For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
- C. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
- D. Samples for each exposed product and for each color and texture specified.
- E. Product certificates.
- F. Maintenance data.

1.3 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and NC State Accessibility Code for toilet compartments designated as accessible.

PART 2 - PRODUCTS**2.1 SOLID-POLYMER UNITS**

- A. Basis of Design: Subject to compliance with requirements, provide Series 1090 by Bobrick Washroom Equipment Inc., or one of the following:
 - 1. Accurate Partitions Corporation.
 - 2. Ampco, Inc.
 - 3. Bradley Corporation; Mills Partitions.
 - 4. Comtec Industries/Capitol Partitions.
 - 5. General Partitions Mfg. Corp.
 - 6. Global Steel Products Corp.
 - 7. Hadrian Manufacturing Inc.
 - 8. Knickerbocker Partition Corporation.
 - 9. Metpar Corp.
 - 10. Partition Systems Incorporated of South Carolina.
 - 11. Sanymetal; a Crane Plumbing company.
- B. Toilet-Enclosure Style: Overhead braced.
- C. Urinal-Screen Style: Wall hung.
- D. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) or polypropylene (PP) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
 - 1. Polymer Panel Finish: One color and pattern in each room.
 - a. Color and Pattern: As selected by Architect from manufacturer's full range.
- E. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.
- F. Brackets (Fittings):
 - 1. Stirrup Type: Ear or U-brackets, clear-anodized aluminum.

2.2 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
 - 1. Material: Stainless steel.
 - 2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees .
 - 3. Latch and Keeper: Manufacturer's standard recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.

4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

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. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, in-swinging doors for standard toilet compartments and 36-inch- wide, out-swinging doors with a minimum 32-inch- 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.
- B. Clearances: Maximum 1/2 inch between pilasters and panels; 1 inch between panels and walls.
- C. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.

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 to return doors to fully closed position.

END OF SECTION

SECTION 10 22 26 - OPERABLE PARTITIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Manually operated, acoustical panel partitions.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design operable panel partitions including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Seismic Performance: Operable panel partitions shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the panels will remain in place without separation of any parts from the assembly when subjected to the seismic forces specified."
- C. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
 - 1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.
 - 2. Acoustical Performance Requirements: Installed operable panel partition assembly, identical to partition tested for STC, tested for NIC according to ASTM E 336, determined by ASTM E 413, and rated for 10 dB less than STC value indicated.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Certificates for Credit MR 7: Chain-of-custody certificates certifying that operable panel partitions comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
 - 2. Product Data for Credit IEQ 4.4: For each composite wood product used in operable panel partitions, documentation indicating that product contains no urea formaldehyde.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Indicate storage and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.

- D. Samples: For each type of exposed material, finish, covering, or facing indicated.
- E. Delegated-Design Submittal: For operable panel partitions indicated to comply with performance requirements, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Design Calculations: Calculate requirements for seismic restraints.
- F. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinated with each other, based on input from installers of the items involved:
- G. Setting Drawings: For embedded items and cutouts required in other work, including support-beam, mounting-hole template.
- H. Seismic Qualification Certificates: For operable panel partitions, accessories, and components, from manufacturer.
- I. Product certificates.
- J. Product test reports.
- K. Field quality-control reports.
- L. Operation and maintenance data.
- M. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to Section 01 40 00 - Quality Requirements for testing indicated.
- C. Fire-Test-Response Characteristics: Provide panels with finishes meeting one of the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 2. Fire Growth Contribution: Meeting acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.
- D. Preinstallation Conference: Conduct conference at Project site.

1.5 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.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Frame: Steel sheet, manufacturer's standard thickness.
- B. Gypsum Board: ASTM C 36/C 36M.

2.2 OPERABLE ACOUSTICAL PANELS

- A. Operable Acoustical Panels: Operable acoustical panel partition system, including panels, seals, finish facing, suspension system, operators, and accessories.
 - 1. Manufacturers: Subject to compliance with requirements, provide Acousti-Seal – 931 by Modernfold, Inc.; a DORMA Group Company, or one of the following:
 - a. Advanced Equipment Corporation.
 - b. Hufcor.
 - c. KWIK-WALL Company.
 - d. Panelfold Inc.
- B. Panel Operation: Manually operated, individual panels.
- C. Panel Construction: Provide top reinforcement as required to support panel from suspension components and provide reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.
- D. Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
- E. STC: Not less than 50.

- F. Panel Closure: Manufacturer's standard.
- G. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.

2.3 SEALS

- A. General: Provide types of seals indicated that produce operable panel partitions complying with acoustical performance requirements and the following:
 - 1. Manufacturer's standard seals.
 - 2. Seals made from materials and in profiles that minimize sound leakage.
 - 3. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.
- B. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.
 - 1. Mechanically Operated for Acoustical Panels: Extension and retraction of bottom seal by operating handle or built-in operating mechanism, with operating range not less than 1-1/2 inches between retracted seal and floor finish.

2.4 FINISH FACING

- A. General: Provide finish facings for panels that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.
 - 1. Steel Face: tension-leveled steel sheet, manufacturer's standard thickness
- B. Trimless Edges: Fabricate exposed panel edges so finish facing wraps uninterrupted around panel, covering edge and resulting in an installed partition with facing visible on vertical panel edges, without trim, for minimal sightlines at panel-to-panel joints.

2.5 SUSPENSION SYSTEMS

- A. Suspension Tracks: Steel or aluminum with adjustable steel hanger rods for overhead support, designed for type of operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.

- B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.
- C. Track Intersections, Switches, and Accessories: As required for type of operation, storage, track configuration, and layout indicated for operable panel partitions, and compatible with partition assembly specified. Fabricate track intersections and switches from steel or aluminum.
 - 1. Multidirectional Switches: Adjustable switch configuring track into L, T, or X intersections and allowing panels to be moved in all pass-through, 90-degree change, and cross-over travel direction combinations.
- D. Steel Finish: Custom color, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

2.6 ACCESSORIES

- A. Storage Pocket Door: Full height at end of partition runs to conceal stacked partition; of same materials, finish, construction, thickness, and acoustical qualities as panels; complete with operating hardware and acoustical seals at soffit, floor, and jambs. Hinges in finish to match other exposed hardware.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with ASTM E 557 except as otherwise required by operable panel partition manufacturer's written installation instructions.
- B. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed.
- C. Install panels from marked packages in numbered sequence indicated on Shop Drawings.
- D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.
- E. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

3.2 ADJUSTING

- A. Adjust operable panel partitions to operate smoothly, without warping or binding. Lubricate hardware and other moving parts.
- B. Adjust storage pocket doors to operate smoothly and easily, without binding or warping. Check and readjust operating hardware. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.3 FIELD QUALITY CONTROL

- A. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and bottom seals for voids; adjust partitions for acceptable fit.
- B. NIC Testing: Engage a qualified testing agency to perform tests and inspections.
- C. Testing Methodology: Perform testing of installed operable panel partition for noise isolation according to ASTM E 336, determined by ASTM E 413, and rated for not less than NIC indicated. Adjust and fit partitions to comply with NIC test method requirements.
- D. Repair or replace operable panel partitions that do not comply with requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of repaired, replaced, or additional work with specified requirements.
- F. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

END OF SECTION

SECTION 102600 - WALL AND CORNER PROTECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Crash rail
- B. Corner guards.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Credit IEQ 4: For adhesives, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: For each wall protection unit. Include sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Samples: For each exposed product and for each finish specified, 12 inches long.
- E. Warranty: Sample of special warranty.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.
- B. Regulatory Requirements: Comply with applicable provisions in ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 WALL GUARDS

A. Crash Rail <CR-01>: Stainless Steel

1. Basis-of-Design Product: Subject to compliance with requirements, provide ProTek Systems, Inc Model CRS-55SSSV or comparable product by one of the following:
 - a. Arden Architectural Specialties, Inc.
 - b. Balco, Inc.
 - c. Construction Specialties, Inc.
 - d. IPC Door and Wall Protection Systems; Division of InPro Corporation.
 - e. Korogard Wall Protection Systems; a division of RJF International Corporation.
 - f. Pawling Corporation.
2. Description:
 - a. 5-1/2 inch by 1-1/16 inch
 - b. 16 ga Type 304 Stainless steel with # 4 finish.

2.2 CORNER GUARDS

A. Surface-Mounted, Stainless Steel <CG-01>:

1. Basis-of-Design Product: Subject to compliance with requirements, provide ProTek Systems, Inc Model CG-50 by or comparable product by one of the following:
 - a. Arden Architectural Specialties, Inc.
 - b. Balco, Inc.
 - c. Construction Specialties, Inc.
 - d. IPC Door and Wall Protection Systems; Division of InPro Corporation.
 - e. Korogard Wall Protection Systems; a division of RJF International Corporation.
 - f. Pawling Corporation.
2. Description:
 - a. 16 ga Type 304 Stainless Steel with #4 finish.
 - b. 3-1/2 inch wing each side with 1/4 inch beveled ends
 - c. 1/8 inch radius

PART 3 - EXECUTION

3.1 INSTALLATION

- #### A. General: Install wall protection units 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.
1. Install wall protection units in locations and at mounting heights indicated on Drawings.

2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
 - a. Provide anchoring devices to withstand imposed loads.
 - b. Where splices occur in horizontal runs of more than 20 feet, splice retainers and covers at different locations along the run, but no closer than 12 inches.
- B. Immediately after completion of installation, clean metal using low-VOC cleaning agent recommended by manufacturer.
- C. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION

SECTION 10 28 13 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Public-use washroom accessories.
- B. Hand dryers.
- C. Childcare accessories.
- D. Custodial accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Wiring Diagrams: For each type of product with hardwired electrical connections.
- C. Product Schedule:
 - 1. Identify locations using room designations indicated on Drawings.
 - 2. Identify products using designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 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.
- B. Toilet Tissue (Roll) Dispenser <TA.5>:
 - 1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-69997
 - 2. Description: Double-roll dispenser.
 - 3. Mounting: Surface mounted.
 - 4. Operation: Noncontrol delivery with standard spindle.
 - 5. Capacity: Designed for 4-1/2- or 5-inch-diameter tissue rolls.
 - 6. Material and Finish: Stainless steel, No. 4 finish (satin) .

C. Paper Towel (Folded) Dispenser <TA.8>:

1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-2620
2. Mounting: Surface mounted.
3. Minimum Capacity: 400 C-fold or 525 multifold towels.
4. Material and Finish: Stainless steel, No. 4 finish (satin).
5. Lockset: Tumbler type.
6. Refill Indicators: Pierced slots at sides or front.

D. Combination Towel (Folded) Dispenser/Waste Receptacle <TA.9>:

1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; Trimline Series B-3803.
2. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
3. Mounting: Recessed.
 - a. Designed for nominal 6-inch wall depth.
4. Minimum Towel-Dispenser Capacity: 600 C-fold or 800 multifold paper towels.
5. Minimum Waste-Receptacle Capacity: 6.3 gal..
6. Material and Finish: Stainless steel, No. 4 finish (satin).
7. Liner: Reusable, molded plastic waste-receptacle liner.
8. Lockset: Tumbler type for towel-dispenser compartment and waste receptacle.

E. Liquid-Soap Dispenser <TA.7>:

1. Basis-of-Design Product: Rohl.
2. Description: Designed for dispensing soap in liquid or lotion form.
3. Mounting: Deck mounted on lavatory .
4. Capacity: 40 oz.
5. Materials: Stainless steel, No. 4 finish (satin).
6. Refill Indicator: Window type.

F. Liquid-Soap Dispenser <TA.21>:

1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-2111.
2. Description: Designed for dispensing soap in liquid or lotion form.
3. Mounting: Vertically oriented, surface mounted.
4. Capacity: 12 oz.
5. Materials: Satin nickel
6. Refill Indicator: Window type.

G. Grab Bar <TA.1 and TA.2 and TA.20>:

1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.. B-6806
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, No. 4, satin finish

4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length:
 - a. TA.1: Straight, 42 inches
 - b. TA.2: Straight, 36 inches
 - c. TA.20: Straight, 18 inches vertical.

H. Sanitary-Napkin Disposal Unit <TA.6>:

1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-254.
2. Mounting: Surface mounted.
3. Door or Cover: Self-closing disposal-opening cover.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin) .

I. Seat-Cover Dispenser <TA.17>:

1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-3013.
2. Mounting: Recessed.
3. Minimum Capacity: 500 seat covers.
4. Exposed Material and Finish: Stainless steel, No. 4 finish (satin) .
5. Lockset: Tumbler type.

J. Mirror Unit <TA.22>:

1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-165
2. Frame: Stainless-steel channel.
 - a. Corners: Manufacturer's standard.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size: As indicated on Drawings.

2.2 HAND DRYERS

A. Hand Dryer <TA.12>:

1. Basis-of-Design Product: Toto Model No. HDR110#SS; Sensor Activated Clean Dry High Speed Concealed Hand Dryer.
2. Mounting: Recessed
3. Operation: Electronic-sensor activated with timed power cut-off switch.
 - a. Operation Time: Automatically turns off upon removal of hands or after 60 seconds of use.
4. Cover Material and Finish: Stainless steel, No. 4 finish (satin)

5. Electrical Requirements: 120 V, 4.25 A, 510 W

2.3 CHILDCARE ACCESSORIES

A. Diaper-Changing Station <TA.16>:

1. Basis-of-Design Product: Koala Corporation; KB110 SSRE
2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
 - a. Engineered to support a minimum of 250-lb static load when opened.
3. Mounting: Semi-recessed, with unit projecting not more than 1 inch from wall when closed.
4. Operation: By pneumatic shock-absorbing mechanism.
5. Material and Finish: Stainless steel, No. 4 finish (satin), exterior shell with rounded plastic corners; high-density polyethylene interior in manufacturer's standard color
6. Liner Dispenser: Built in.

2.4 FABRICATION

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf), when tested according to ASTM F 446.

END OF SECTION

SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fire protection cabinets for fire extinguishers.
- B. Portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. Coordinate sizes and locations of fire protection cabinets with wall depths.
- C. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10 Portable Fire Extinguishers.
- D. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
- E. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.
- F. Provide fire extinguishers, fire protection cabinets, and mounting brackets by a single manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:

- a. Fire End & Croker Corporation.
- b. J. L. Industries, Inc., a division of Activar Construction Products Group.
- c. Larsen's Manufacturing Company.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

2.3 FIRE PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
- B. Cabinet Material: Steel sheet.
- C. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.
 1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
- D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.
 1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
- E. Cabinet Trim Material: Same material and finish as door.
- F. Door Material: Steel sheet
- G. Door Style: Flush opaque panel, frameless, with no exposed hinges.
- H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
- I. 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. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle .
 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
 - a. Identify fire extinguisher in fire protection cabinet with the words FIRE EXTINGUISHER.

- 1) Location: Applied to cabinet door
- 2) Application Process: Decal
- 3) Lettering Color: White.
- 4) Orientation: Vertical

J. Finishes:

1. Steel: Factory primed for field painting

K. Fire Protection Cabinet Fabrication: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Miter and weld joints and grind smooth.

2.4 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B
- B. Multipurpose Dry-Chemical Type : UL-rated 2A:10BC nominal capacity, with monoammonium phosphate-based dry chemical in Add other types and capacities to suit Project.

2.5 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
1. Identify bracket-mounted fire extinguishers with the words FIRE EXTINGUISHER in red letter decals applied to mounting surface.
 - a. Orientation: Vertical

PART 3 - EXECUTION

3.1 FIRE PROTECTION CABINET INSTALLATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed and prepare recesses as required by type and size of cabinet and trim style.

- B. Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- C. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
- D. Identification: Apply at locations indicated.
- E. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- F. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.2 FIRE EXTINGUISHER INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION

SECTION 10 75 00 - FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes ground-mounted aluminum flagpoles.

1.2 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. Wind Loads: 130 mph, exposure C according to SEI/ASCE 7.
 - 2. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Delegated-Design Submittal: For flagpole assemblies indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Include loads, point reactions, and locations for attachment of flagpoles to building's structure.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Flagpole; a Kearney-National Inc. company.
 - 2. Atlantic Fiberglass Products, Inc.

3. Concord Industries, Inc.
4. Lingo Inc.; Acme Flagpole Company Division.
5. Pole-Tech Company Inc.
6. U.S. Flag & Flagpole Supply, LP.
7. USS Manufacturing Inc.

2.2 FLAGPOLES

- A. Exposed Height: 30 feet.
- B. 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.
- C. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, not less than 0.064-inch- nominal wall thickness. Provide with 3/16-inch steel bottom plate and support plate; 3/4-inch- diameter, steel ground spike; and steel centering wedges welded together. Galvanize steel after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole. Provide flashing collar of same material and finish as flagpole.
- D. Cast-Metal Shoe Base: For anchor-bolt mounting; provide with anchor bolts.
- E. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter. Fabricate from 0.063-inch spun aluminum, finished to match flagpole.
- F. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.
- G. Halyard Flag Snaps: Provide two swivel snap hooks per halyard.

2.3 MISCELLANEOUS MATERIALS

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.
- B. Sand: ASTM C 33, fine aggregate.
- C. Elastomeric Joint Sealant: Joint sealant complying with requirements in Section 07 92 00 - Joint Sealants.

2.4 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where shown and according to manufacturer's written instructions.
- B. Ground Set: Place foundation tube, center, and brace to prevent displacement during concreting. Install flagpole, plumb, in foundation tube. Place tube seated on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.
- C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.
- D. Mounting Brackets and Bases: Anchor brackets and bases securely through to structural support with fasteners as indicated on Shop Drawings.

END OF SECTION

SECTION 11 30 00 LOADING DOCK EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Dock levelers.

1.2 DEFINITIONS

- A. Operating Range: Maximum amount of travel above and below the loading dock level.
- B. Working Range: Recommended amount of travel above and below the loading dock level for which loading and unloading operations can take place.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For loading dock equipment. 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. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples: For each fabric and for each color and texture specified.
- D. Welding certificates.
- E. Product test reports.
- F. Operation and maintenance data.
- G. Warranty: Sample of special warranty.

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. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."

- C. 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.
- D. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with loading dock equipment, including slopes of driveways and heights of loading docks, by field measurements before fabrication.

1.6 WARRANTY

- A. Special Warranty for Dock Levelers: Manufacturer's standard form in which manufacturer agrees to repair or replace dock-leveler components that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including cracked or broken structural support members, load-bearing welds, and front and rear hinges.
 - b. Faulty operation of operators, control system, or hardware.
 - c. Deck plate failures including cracked plate or permanent deformation in excess of 1/4 inch between deck supports.
 - d. Hydraulic system failures including failure of hydraulic seals and cylinders.
 - 2. Warranty Period for Structural Assembly: 10 years from date of Substantial Completion.
 - 3. Warranty Period for Hydraulic System: Five years from date of Substantial Completion.
 - 4. Warranty shall be for unlimited usage of leveler for the specified rated capacity over the term of the warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Rite- Hite
- B. Subject to compliance with requirements, other manufacturers with comparable products include:
 - 1. Blue Giant U-Series

2.2 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM 36/A 36M.
- B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from steel plate complying with ASTM A 572/A 572M, Grade 55.
- C. Steel Tubing: ASTM A 500, cold formed.
- D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- E. Wood: DOC PS 20 dimension lumber, select structural grade, kiln dried.
- F. Pressure-Treated Wood: DOC PS 20 dimension lumber, select structural grade, kiln dried, and pressure treated with waterborne preservatives to comply with AWPA C2.

2.3 DOCK LEVELERS

- A. General: Recessed dock levelers designed for permanent installation; of type, function, operation, capacity, size, and construction indicated; and complete with controls, safety devices, and accessories required.
 - 1. Manufacturers: Subject to compliance with requirements, provide RHH-4000 Series by Rite-Hite Corporation, or one of the following:
 - a. Blue Giant Equipment Corporation.
- B. Standard: Comply with MH 30.1, except for structural testing to establish rated capacity.
- C. Rated Capacity: Capable of supporting total gross load of not less than 20,000 without permanent deflection or distortion.
- D. Platform: Not less than 3/8-inch- thick, nonskid steel plate.
 - 1. Platform Size: As indicated on Drawings.
- E. Hinged Lip: Not less than 3/8-inch- thick, nonskid steel plate.
 - 1. Hinge: Full width, piano-type hinge with heavy-wall hinge tube and greased fittings.
- F. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.
 - 1. Vertical Travel: Operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact with the following minimum working range:
 - a. Above Adjoining Platform: 12 inches.
 - b. Below Adjoining Platform: 12 inches.

2. Automatic Vertical Compensation: Floating travel of ramp with lip extended and resting on truck bed shall compensate automatically for upward or downward movement of truck bed during loading and unloading.
 3. Lip Operation: Manufacturer's standard mechanism that automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler's working range, allows lip to yield under impact of incoming truck, and automatically retracts lip when truck departs.
 - a. Length of Lip Extension: 16 inches.
- G. Hydraulic Operating System: Electric control from an interior remote-control station; fully hydraulic operation. Electric-powered hydraulic raising and hydraulic lowering of ramp. Equip leveler with a packaged unit including a unitized, totally enclosed, nonventilated electric motor, pump, manifold reservoir, and valve assembly of proper size, type, and operation for capacity of leveler indicated. Include means for lowering ramp below platform level with lip retracted behind dock bumpers. Provide a hydraulic velocity fuse connected to main hydraulic cylinder to limit loaded ramp's free fall to not more than 3 inches.
- H. Construction: Fabricate dock-leveler frame, platform supports, and lip supports from structural- or formed-steel shapes. Weld platform and hinged lip to supports. Fabricate entire assembly to withstand deformation during both operating and stored phases of service. Chamfer lip edge to minimize obstructing wheels of material-handling vehicles.
1. Cross-Traffic Support: Manufacturer's standard method of supporting ramp at platform level in stored position with lip retracted. Provide a means to release supports to allow ramp to descend below platform level.
 2. Maintenance Strut: Integral strut to positively support ramp in up position during maintenance of dock leveler.
- I. Finish: Cold-spray galvanize dock levelers after assembly.

2.4 STEEL FINISHES

- A. Galvanizing: Hot-dip galvanize components as indicated to comply with the following:
1. ASTM A 123/A 123M for iron and steel loading dock equipment.
 2. ASTM A 153/A 153M or ASTM F 2329 for iron and steel hardware for loading dock equipment.
- B. Galvanized-Steel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Color selected by Architect from manufacturers full range.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine roughing-in for electrical systems for loading dock equipment to verify actual locations of connections before equipment installation.
- B. Examine walls and floors of pits for suitable conditions where recessed loading dock equipment is to be installed. Pits shall be plumb and square and properly sloped for drainage from back to front of loading dock.
- C. Set curb angles in concrete edges of dock-leveler recessed pits with tops flush with loading platform. Fit exposed connections together to form hairline joints.
- D. Install loading dock equipment, including motors, pumps, control stations, wiring, safety devices, and accessories as required for a complete installation.
 - 1. Rough-in electrical connections according to requirements specified in Division 26 Sections.
- E. Recessed Dock Levelers: Attach dock levelers securely to loading dock platform, flush with adjacent loading dock surfaces and square to recessed pit.
- F. Adjust loading dock equipment to function smoothly and safely, and lubricate as recommended by manufacturer.
- G. Test dock levelers for vertical travel within operating range indicated.

3.2 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain loading dock equipment.

END OF SECTION

SECTION 11 31 00 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Cooking appliances.
- B. Refrigeration appliances.
- C. Cleaning appliances.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit EA 1.4 : For appliances indicated, documentation that products are ENERGY STAR rated.
- C. Samples: For each exposed product and for each color and texture.
- D. Product certificates.
- E. Field quality-control reports.
- F. Warranties: Sample of special warranties.
- G. Operation and maintenance data.

1.3 QUALITY ASSURANCE

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

1.4 WARRANTY

- A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified 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 one of the following
1. Amana; a division of Whirlpool Corporation.
 2. General Electric Company (GE).
 3. General Electric Company (Hotpoint).
 4. KitchenAid; a division of Whirlpool Corporation.
 5. Maytag; a division of Whirlpool Corporation.
 6. Whirlpool Corporation.

2.2 MICROWAVE OVEN

- A. Microwave Oven:
1. Basis-of-Design Product: KitchenAid Model KCMS1555S - Countertop
 2. Capacity: 1.5 cu. ft..
 3. Exhaust Fan: Nonvented, recirculating type with charcoal filter and with manufacturer's standard capacity.
 4. Microwave Power Rating: 1200 W.
 5. Material: Stainless steel.
 6. Accessories: Include trim kit for built in installation.

2.3 REFRIGERATOR/FREEZERS

- A. Refrigerator/Freezer Two-door, side-by-side refrigerator/freezer and complying with AHAM HRF-1.
1. Basis-of-Design Product: KitchenAid KSCS23FVMK
 2. Type: Freestanding.
 3. Storage Capacity:
 - a. Refrigeration Compartment Volume: 14.0 Cu Ft
 - b. Freezer Volume: 9.1 Cu. Ft
 4. General Features:
 - a. Dispenser in door for ice and cold water.
 - b. Interior light in refrigeration compartment.
 - c. Automatic defrost.
 - d. Interior light in freezer compartment.
 - e. Automatic icemaker and storage bin.
 5. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

6. Front Panels: Monochromatic Stainless Steel

2.4 DISHWASHERS

- A. Dishwasher: Complying with AHAM DW-1 and ASSE 1006.
 1. Basis-of-Design Product: KitchenAid KUDD03ST Drawer Dishwasher
 2. Type: Drawer.
 3. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
 4. Front Panel: Stainless steel

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- B. Utilities: Comply with plumbing and electrical requirements.

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 3. Operational Test: After installation, start units to confirm proper operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- C. Prepare test and inspection reports.

END OF SECTION

SECTION 11 40 00 - FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the contract including general and supplementary conditions and general requirements apply to the work specified in this section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Plumbing: Refer to Division 22, including:
 - 1. Rough-in piping for water supply and waste lines.
 - 2. Piping for supply and waste lines.
 - 3. Traps, grease traps, line strainers, tail pieces, valves, stops, shut-offs and miscellaneous fittings required for complete installation.
 - 4. Final connections.
 - 5. Indirect drains for sink compartments.
- B. Electrical: Refer to Division 26, including:
 - 1. Rough-in conduit, wiring, line and disconnect switches, safety cut-offs and fittings, control panels, fuses, boxes and fittings required for complete installation.
 - 2. Final connections, including mounting and wiring of switches furnished as part of the food service equipment (unless otherwise indicated on the drawings).

1.3 WORK INCLUDED THIS SECTION:

- A. Furnish and install all food service equipment as specified herein, including that which is reasonably inferred, with all related items necessary to complete work shown on contract drawings and/or required by these specifications.
- B. Electrical Work:
 - 1. Interwiring of food service equipment between components within equipment, such as heating elements, switches, thermostats, motors, etc., complete with junction box as is applicable, ready for final connection.
 - 2. Voltages shall be as indicated on contract drawings. Any differences in electrical characteristics at job site from those shown on contract documents must be submitted to Architect for consideration prior to ordering equipment.
- C. Plumbing Work:
 - 1. Furnish all equipment with faucets, sink waste assemblies, and trim as specified in this section.
 - 2. Other than sink compartments, extend all indirect waste lines to nearest floor receptor. All such drain lines to be properly sized. Drain shall terminate with proper air gap above flood rim of floor receptor. Drain lines to be copper with silver paint unless specified otherwise. Drain lines in public areas to be chrome plated where exposed to view.

1.4 QUALITY ASSURANCE

- A. It is required that all custom fabricated equipment such as food serving units, tables, sinks, counter tops, etc., be manufactured by a food service equipment fabricator who has the plant, personnel and engineering equipment required. Such manufacturer shall be subject to approval of Architect.
All work in above category shall be manufactured by one manufacturer, and shall be of uniform design and finish.
- B. Manufacturer of this equipment must be able to show that he is now and for the past five years has been engaged in manufacture or distribution of equipment, as required under this contract, as his principal product.
- C. Manufacturer of equipment herein specified shall be a recognized distributor for items of equipment specified herein which are of other manufacture than his own.
- D. Only manufacturers who can meet the foregoing qualifications will be acceptable.
- E. All work shall be done in an approved workmanlike manner, to the complete satisfaction of the Owner.

1.5 SUBMITTALS

- A. Submit shop drawings as required by General Conditions. All shop drawings and rough-in drawings shall be CAD drafted, and must be submitted in .DWF or .PDF electronic format. Multiple hard copies are not acceptable.
- B. Shop drawings and bound brochures covering manufactured or "buy-out" items covering all work and equipment included in this contract shall be submitted to Architect as soon as possible after award of contract. After approval, Food Service Equipment Contractor shall furnish to Architect sets of shop drawings and brochures, corrected as required by virtue of review comments, for distribution to various interested trades on project. All costs of reproduction and submission shall be part of contract.

Bound brochure and cut sheet submittals must be copied to Owner for review and comment.
- C. Provide fully dimensioned rough-in plans at 1/4" scale, consisting of a separate drawing for each discipline. Each drawing shall show equipment shaded down 50%. Rough-in set shall include all required mechanical, electrical, plumbing, services for equipment and dimensioned rough-in location for same. Rough-in locations shown shall make allowances for required traps, switches, etc., thereby not requiring interpretation or adjustment on the part of other Contractors.

Drawings shall indicate dimensions for floor depressions, wall openings, etc., for equipment.

Food Service Equipment Contractor shall visit site to verify all rough-in and sleeve locations prior to installation of finished floors, and shall cooperate with other Contractors involved in proper location of same. Food Service Equipment Contractor shall be responsible for any required relocations of rough-in due to errors or inaccuracies on those rough-in plans which he prepares.

- D. Rough-in plans shall include all required services which relate to equipment but which may not directly connect thereto, such as convenience outlets at walls, hose stations, floor drains, etc.
- E. Rough-in plans shall also include all required outlet services for equipment which is designated on drawing schedule, even though such equipment may not be included in this contract.
- F. Fully dimensioned and detailed shop drawings of custom fabricated equipment items shall be submitted, drawn at 3/4" and 1 - 1/2" scale for plans, elevations and sections respectively.

Drawings shall show all details of construction, installation, and relation to adjoining and related work where cutting or close fitting is required. Drawings shall show all reinforcements, anchorage, and other work required for complete installation of all fixtures.

- G. Do not begin fabrication of custom manufactured equipment until approvals of shop drawings have been received and until field measurements have been taken by Food Service Equipment Contractor, where such measurements are necessary to assure proper conformance with intent of contract drawings and specifications.
- H. Make field measurements, giving due consideration to any architectural, mechanical, or structural discrepancies which may occur during construction of building. No extra compensation will be allowed for any difference between actual measurements secured at job site and dimensions indicated on contract drawings. Any differences which may be found at job site during field measurements shall be submitted to Architect for consideration before proceeding with fabrication of equipment.
- I. Submit illustrative brochures for manufactured or "buy-out" equipment items, complete with illustrations, specifications, line drawings, rough-in requirements, and list of accessories or other specified additional requirements. Brochures shall be bound and shall include data on all equipment which is to be provided, arranged in numerical sequence which conforms to item numbers of specifications. Omission of data does not reduce obligation to provide items as specified.
- J. Approval of shop schedules and brochures will be in general and shall be understood to mean that Architect has no objection to use of materials or processes shown. Approval does not relieve Food Service Equipment Contractor from responsibility for errors, omissions, or deviations from contract requirements.

1.6 SUBSTITUTIONS - STANDARDS

- A. Refer to Instructions to Bidders and Division 01 for requirements.

- B. All unspecified substitutions after bid must be submitted to Owner for written approval prior to acceptance.

1.7 DRAWINGS

- A. Drawings which constitute part of contract documents indicate general arrangement of piping and location of equipment. Should it be necessary to deviate from arrangement indicated in order to meet structural conditions, make such deviations without expense to Owner.
- B. Specifications and drawings are reasonably exact, but their extreme accuracy is not guaranteed. Drawings and specifications are for assistance and guidance of Contractor, and exact locations, distances and levels shall be governed by the building.

1.8 MANUFACTURER'S DIRECTIONS

- A. Follow manufacturer's directions in all cases where manufacturers of articles used in this contract furnish directions or prints covering points not shown on drawings or specifications.

1.9 INDUSTRY STANDARDS

- A. Electric operated and/or heated equipment, fabricated or otherwise, shall conform to latest standards of National Electric Manufacturers Association and of Underwriters Laboratories, Inc., and shall bear the U.L. label.
- B. Hot food holding equipment shall meet minimum construction standards as noted by NSF #4.
- C. Refrigeration equipment shall meet minimum construction standards as noted by NSF #7.
- D. Items of food service equipment furnished shall bear the N.S.F. seal.
- E. Food service equipment shall be installed in accord with N.S.F. standards.
- F. Work and materials shall be in compliance with requirements of applicable codes, ordinances and regulations, including but not limited to those of Occupational Safety and Health Act (OSHA), National Fire Protection Association, State Fire Marshal, State Accident Commission, U.S. Public Health Service, State Board of Health, local health codes, etc.
- G. No extra charge will be paid for furnishing items required by regulations, even though such may not be shown on drawings or called for in these specifications.
- H. Rulings and interpretations of enforcing agencies shall be considered part of regulations.

PART 2 - PRODUCTS

2.1 MANUFACTURED EQUIPMENT

- A. All like types of equipment such as all refrigerated and heated cabinets, all ovens, and all mixers shall be by the same manufacturer.
- B. Except as may be specified otherwise under individual item specifications in "Equipment Schedule", all items of standard manufactured equipment shall be complete in accord with manufacturer's standard specification for specific unit or model called for, including finishes, components, attachments, appurtenances, etc., except as follows:
- C. All items of standard equipment shall be that manufacturer's latest model at time of delivery.
- D. Substitutions for manufactured equipment specified will be accorded consideration under terms set forth in "Substitutions - Standards".

2.2 FABRICATED EQUIPMENT

- A. Stainless steel shall be U.S. standard gauges as called for, 18-8, Type 302, or 304 type, No. 4 finish.
- B. Galvanized iron shall be Armco or equal. Framework of galvanized iron shall be welded construction, having welds smooth, and where galvanizing has been burned off, touched up with high grade aluminum bronze.
- C. Legs and crossrails shall be continuously welded, unless otherwise noted, and ground smooth.
- D. Bottom of legs at floor shall be fitted with sanitary stainless steel bullet type foot, with not less than 2" adjustment.
- E. Legs shall be fastened to equipment as follows:
 - 1. To sinks by means of closed gussets. Gussets shall be stainless steel, reinforced with bushing, having set screws for securing legs.
 - 2. To tables and drainboards with closed gussets which shall be welded to stainless steel hat sections or channels, 14 gauge or heavier, exposed hat sections having closed ends. Bracing shall be welded to underside of tops.
- F. Closed gussets shall be a 3" minimum diameter at top, continuously welded to frame members or to sink bottom.
- G. Sinks, unless otherwise specified, shall be furnished with rotary type waste outlets, without connected overflows: Atlantic Brass Works Model 772-RB; Fisher Brass Foundry Model 250A; T&S; or approved equal. Where exposed, furnish wastes chromium plated.

- H. Rolls shall be 1 1/2" diameter, except as detailed contrary, with corners bullnosed, ground and polished.
- I. Seams and joints shall be shop welded. Welds to be ground smooth and polished to match original finish. Materials 18 gauge or heavier shall be welded.
- J. Metal tops shall be one-piece welded construction, unless specified otherwise, reinforced on underside with stainless steel hat sections or channels welded in place. Crossbracing to be not more than 30" on centers.
- K. Drawers to be 18 gauge stainless steel channel type housing and drawer cradle, both housing and cradle being reinforced and welded at corners, housing being secured to underside of table top, and both housing and cradle being sized for and fitted with 18 gauge 20" x 20" x 5" deep stainless steel drawer insert having coved corners. Drawer insert shall be easily removable from cradle without tools or having to remove entire drawer. Drawers to have stainless steel fronts. Provide with recessed flush type stainless steel pulls.
- L. Support drawer on fabricated 14 gauge stainless steel interlocking channel solid delrin ball bearing wheels. Support slides shall be load rated at 200 lb. per pair. Slides to be Component Hardware S52 Series.
- M. Enclosed cabinet type bases shall be made of formed steel sheets reinforced with formed steel sections to create a rigid structure. Steel shall be 18 gauge or heavier. Base shall be welded construction throughout with front rails, mullions, etc., welded to appear as one-piece construction. All exposed sections of interior and exterior shall be stainless steel, and unexposed sections shall be galvanized steel, unless specified contrary.
- N. Hardware shall be solid materials and except where unexposed or specified contrary, of cast brass, chrome plated. Stampings are not acceptable. Identify all hardware with manufacturer's name and number so that broken or worn parts may be ordered and replaced.
- O. Fabricate sink compartments with fully coved vertical and horizontal corners. Multiple compartment partition to be double thickness, continuously welded where sheets join at top. Front of multiple compartment sinks to be continuous on exterior. Bottoms shall be creased to drain.
- P. Ends of all fixtures, splashbacks, shelves, etc., shall be finished flush to walls or adjoining fixtures.
- Q. Splashbacks shall have radius bends in all horizontal and vertical corners, coved at intersections.
- R. Rounded and coved corners or radius bends shall be 1/2" radius or longer.
- S. Shelves in fixtures with enclosed bases shall be turned up on back and sides and feathered slightly to insure tight fit to enclosure panels. Bottom shelves shall be made for easy removal unless otherwise noted.

T. Undersides of tops to be coated with heavy-bodied resinous material compounded for permanent, non-flaking adhesion to metal, 1/8" thick, applied after reinforcing members have been installed, drying without dirt-catching crevices.

U. Metal components, unless specified or noted otherwise, to be the following gauges:

Counter and table tops	14 ga.	Stainless Steel
Wall shelves	16 ga.	Stainless Steel
Pipe leg undershelves	16 ga.	Stainless Steel
Drawer fronts	16 ga.	Stainless Steel
Enclosed cabinet bases	18 ga.	Stainless Steel
Sinks and drainboards	14 ga.	Stainless Steel
Legs 1 - 5/8" diameter	16 ga.	Stainless Steel

2.3 HEATING EQUIPMENT

A. Wherever electric heating equipment or thermostat control for such equipment is specified, it shall be complete, and of the materials, size and rating specified within equipment item or details. All such equipment shall be designed and installed to be easily cleaned or to be easily removed for cleaning.

B. Electrical appliances or heating element circuits of 120 volts shall not exceed 1650 watts, unless specifically shown contrary.

2.4 SWITCHES AND CONTROLS

A. Food Service Equipment Contractor shall supply on each motor driven appliance or electrical heating unit suitable control switch of proper type in accord with Underwriter's Code.

B. All internal wiring for fabricated equipment items included, all electrical devices, wiring, controls, switches, etc., built into or forming an integral part of these items shall be furnished and installed by Food Service Equipment Contractor in his factory or building site with all items complete to junction box for final connection to building lines by Electrical Contractor.

C. Provide standard 3-prong plugs to fit "U" slot grounding type receptacles, similar to No. 5262, for all equipment items powered by plugging into 110-120 volts, single phase AC. Also, provide suitable length 3-wire cord for equipment.

2.5 CONNECTION TERMINALS

A. All equipment shall be complete with connection terminals as standardized by equipment manufacturers, except where specified otherwise.

PART 3 - EXECUTION

3.1 GENERAL

- A. Work under this contract and covered under this section of specifications includes but is not limited to:
1. Cutting of holes and/or ferrules on equipment for piping, drains, electrical outlets, conduits, etc. as required to coordinate installation of food service equipment with work of other Contractors on project.
 2. Field checking of building and rough-in requirements, and submission of brochures and shop drawings, all as required hereinbefore under "Submittals".
 3. Repair of all damage to premises as result of this installation, and removal of all debris left by those engaged in this installation.
 4. Having all food service equipment fixtures completely cleaned and ready for operation when building is turned over to Owner.

3.2 INSTALLATION PROCEDURES

- A. Food Service Equipment Contractor shall make arrangements for receiving his custom fabricated and "buy out" equipment and shall make delivery into building as requisitioned by his installation superintendent. He shall not consign any of his equipment to Owner or to any other Contractor unless he has written acceptance from them and has made satisfactory arrangements for the payment of all freight and handling charges.
- B. Food Service Equipment Contractor shall deliver all of his custom fabricated and "buy out" equipment temporarily in its final location, permitting Trades to make necessary arrangements for connection of service lines; he shall then move equipment sufficiently to permit installation of service lines, after which he shall realign his equipment level and plumb, making final erection as shown on contract drawings.
- C. All portable or counter mounted equipment weighing in excess of 25 pounds shall be mounted on 4" stainless steel adjustable legs.
- D. This Contractor shall coordinate his work and cooperate with other trades working at site toward the orderly progress of the project.
- E. Food Service Equipment Contractor shall assist Architect, Owner, and/or Owner's Agent in making any desired tests during or prior to final inspection of equipment; he shall remove immediately any work or equipment rejected by Architect, Owner, and/or Owner's Agent, replacing same with work conforming with contract requirements, and shall reimburse mechanical and/or other contractors involved for extra work made necessary by such replacement.
- F. This Contractor shall keep premises free from accumulation of his waste material and rubbish, and at completion of his work shall remove his rubbish and implements, leaving areas of his work broom clean.

- G. This Contractor shall provide and maintain coverings or other approved protection for finished surfaces and other parts of his equipment subject to damage during and after erection. After removal of protective coverings, all field joints shall be ground and polished and entire work shall be thoroughly cleaned and polished.

3.3 TRIMMING AND SEALING EQUIPMENT

- A. Seal completely spaces between all units to walls, ceilings, floors, and adjoining (not portable) units with enclosed bodies against entrance of food particles or vermin by means of trim strips, welding, soldering, or commercial joint material best suited to nature of equipment and adjoining surface material.
- B. Close ends of all hollow sections.
- C. Equipment butting against walls, ceilings, floor surfaces and corners to fit tightly against same; backsplashes or risers which fit against wall to be neatly scribed and sealed to wall with DowCorning # 732 RTV or General Electric clear silicone sealant, wiping excess sealant out of joint to fillet radius. Where required to prevent shifting of equipment and breaking wall seal, anchor item to floor or wall.

3.4 TESTING AND DEMONSTRATION OF EQUIPMENT

- A. After completion of installation, all equipment using water and electricity shall be performance inspected and tested by factory certified service agent, including wet test of hood fire suppression systems, if so required. Food Service Equipment Contractor shall document that these inspections have been performed prior to scheduling demonstrations and Owner acceptance of equipment.
- B. Food Service Equipment Contractor shall arrange to have all manufactured, mechanically operated equipment furnished under this contract demonstrated by authorized representatives of equipment manufacturers, these representatives to instruct Owner's designated personnel in use, care and maintenance of all items of equipment after same are in working order. Demonstration and instruction shall be held on dates designated by Owner.
- C. Food Service Equipment Contractor shall provide a competent service representative to be present when installation is put into operation.

3.5 EQUIPMENT HANDLING AND STORAGE

- A. Deliver equipment to site, properly crated and protected, and store in safe place, protected from damage until time for installation.

3.6 GUARANTEE

- A. Special Project Warranty: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required, provided manufacturer's instructions for handling, installing, protecting, and

maintaining units have been adhered to during warranty period. This warranty shall be in addition to, and not limitation of, the rights the Owner may have against the Contractor under the Contract Documents.

B. Warranty Period:

1 year from date of Substantial Completion, all new equipment furnished. However, manufacturer's warranty shall prevail when the period is longer than one year.

5 years warranty period on refrigeration compressors.

3.7 OPERATING AND MAINTENANCE MANUALS

- A. After completion of installation, Food Service Equipment Contractor shall present to Owner three sets of all operating and maintenance manuals, covering all mechanically operated equipment furnished under this contract, each set being neatly bound in looseleaf binder having durable cover.
- B. Include in each binder a list of names, addresses and telephone numbers of local servicing agencies authorized to make necessary repairs and/or adjustments of equipment furnished under this contract.

PART 4 - EQUIPMENT SCHEDULE

ITEM 01	UTILITY CART	QUANTITY AS SCHEDULED

Provide stainless steel welded cart having the following features:

- A. Push handles on both ends.
- B. Three shelves, 14 gauge stainless steel, 23" x 35".
- C. 5" diameter swivel casters, locking type.
- D. Non-marking vinyl corner bumpers (sleeve type).

Cart to be Delfield, Model UC-3SS, Lakeside, or Piper/Servolift.

ITEM 02	HOT CABINET, MOBILE	QUANTITY AS SCHEDULED

Provide mobile hot cabinet having the following features:

- A. 1.5 KW heater.
- B. Half-height doors.
- C. Aluminum body cabinet, insulated.
- D. Universal pan slides.

E. 5" diameter casters, two with brakes.

F. Cord and plug.

Cabinet to be as manufactured by Crescor, Model H-135-UA-11, Metro, or FWE.

ITEM 03 SERVING COUNTER, HOT FOOD, 4-WELL QUANTITY AS SCHEDULED

Provide modular serving counter having the following features:

- A. Basic 18 gauge stainless steel counter section with 16 gauge stainless steel top.
- B. Four individual hot food wells with pre-wired controls, voltage characteristics as scheduled. Wells to be dry\moist, with manifold and valve in accessible location.
- C. Heavy duty casters with brakes.
- D. Stainless steel 8" fold down work board.
- E. Cord and plug set.
- F. Install in banked line-up as shown on drawings.
- G. Line-up locks.
- H. Counter to be 35 inches high.
- I. Open understorage with shelf.

Hot food counter to be by Randell, Model RAN HTD-4S, Delfield, or Select Stainless.

ITEM 04 SERVING COUNTER, SOLID TOP QUANTITY AS SCHEDULED

Provide modular serving counter of size and content as shown on Plan drawings, having the following features:

- A. Basic 18 gauge stainless steel base with 16 gauge stainless steel top.
- B. Stainless steel 8" fold down work board.
- C. Open under storage with shelf.
- D. Heavy duty casters with brakes, two locking.
- E. Counter to be 35" high.
- F. Line-up lock.

Counter to be as manufactured by Randell, Model 14G ST-4S, Delfield, or Select Stainless.

ITEM 05	WALL SHELF	QUANTITY AS SCHEDULED

Provide wall shelf with the following features:

- A. 16 gauge stainless steel construction.
- B. Stainless steel angle brackets.
- C. 12" deep x 108" long.
- D. Mount 54" A.F.F. where shown on Plan.

Wall shelf to be as manufactured by Select Stainless, Model 9WS-12, Universal, or fabricated equal.

ITEM 06	WALL SHELF	QUANTITY AS SCHEDULED

Provide wall shelf with the following features:

- A. 16 gauge stainless steel construction.
- B. Stainless steel angle brackets.
- C. 12" deep x 72" long.
- D. Mount 54" A.F.F. where shown on Plan.

Wall shelf to be as manufactured by Select Stainless, Model 6WS-12, Universal, or fabricated equal.

ITEM 07	1-COMPARTMENT SINK	QUANTITY AS SCHEDULED

Provide one-compartment sink with drainboards as follows:

- A. Approximate overall size: 30" deep x 75" long (nom.).
- B. Marine (non-spill) table edges; 9" high backsplash along rear.
- C. Sink to be 24" x 24" x 14" deep, creased to drain, with lever waste outlet.
- D. Drainboard, to right of sink, to be 48" long, shelf under drainboard.
- E. 14 gauge stainless steel top construction.
- F. Legs and crossrails to be 1 5/8" diameter stainless steel with adjustable feet.
- G. Provide T&S B-0231 faucet.

Sink to be as manufactured by Select Stainless, Model 1B24-RD48-14, Universal, or fabricated equal.

ITEM 08 FREEZER, WORK TOP, 1-SECTION QUANTITY AS SCHEDULED

Provide worktop freezer having the following features:

- A. Self-contained, air-cooled refrigeration system, voltage as scheduled, with condensate evaporator.
- B. Stainless steel construction, and exterior finishes with polyurethane insulated interior.
- C. Heavy duty 5" casters with brakes.
- D. Stainless steel worktop with backsplash.
- E. Interior thermometer.
- F. Cord and plug.

Unit to be as manufactured by True, Model TWT-27F, Beverage-Air, or Master-Bilt.

ITEM 09 REFRIGERATOR, REACH-IN, 2-SECTION QUANTITY AS SCHEDULED

Provide two-section reach-in refrigerator with bottom mounted air-cooled condensing unit, exterior dial thermometer, cylinder door locks and bottom mounted condensate evaporator, having the following features:

- A. Full-height doors, hinged as shown on drawings.
- B. Stainless steel exterior and aluminum interior.
- C. Standard compliment of adjustable wire shelves.
- D. 5" dia. casters with brakes.
- E. Voltage as scheduled, with cord and plug set.

Refrigerator to be as manufactured by True, Model T-49, Beverage-Air, or Master-Bilt.

ITEM 10 NOT USED

ITEM 11 CLEAN POT SHELVING QUANTITY AS SCHEDULED

Provide four-tier wire shelving unit complete with tubular uprights and having the following features:

- A. Uprights shall be nominal 74" high.

- B. Treated zinc plated shelving.
- C. 5" casters, resilient rubber tread.
- D. 24" x 48" shelves.

Shelving to be as manufactured by Metro, Model 2448BR, Eagle, or I.S.S.

ITEM 12 3-COMPARTMENT SINK QUANTITY AS SCHEDULED

Provide 3-compartment sink with drainboards as follows:

- A. Approximate overall size: 30" deep x 118" long.
 - B. Rolled table edges; 9" high backsplash along rear.
 - C. Sinks to be 18" x 24" x 14" deep, creased to drains, with lever waste outlets.
 - D. Drainboards to be 30" long.
 - E. 14 gauge stainless steel top construction.
 - F. Legs and crossrails to be 1 5/8" diameter stainless steel with adjustable feet.
 - G. Provide T&S B-0230 faucet.
- Sink to be as manufactured by Select Stainless, Model 3B1824-2D30-14, Universal, or fabricated equal.

ITEM 13 WALL SHELF W/ UTENSIL RAIL QUANTITY AS SCHEDULED

Provide wall shelf with the following features:

- A. 16 gauge stainless steel construction.
- B. Stainless steel angle brackets.
- C. 12" deep x 108" long.
- D. Utensil rail with sliding hooks, 14 each.
- E. Mount 66" A.F.F. where shown on Plan.

Wall shelf to be as manufactured by Select Stainless, Model 9WSPR-12, Universal, or fabricated equal.

ITEM 14 WORKTABLE QUANTITY AS SCHEDULED

Provide stainless steel worktable having the following features:

- A. 36" wide x 72" long.

- B. 14 gauge stainless steel top with square edges and reinforcing on underside.
- C. 1 5/8" diameter stainless steel legs with adjustable feet.
- D. Stainless steel undershelf.
- E. Heavy duty casters with brakes.
- F. 20" x 20" x 5" deep stainless steel drawer set in a stainless steel channel frame and mounted on stainless steel roller bearings (two each).

Worktable to be as manufactured by Select Stainless, Model 6SU-36-14, Universal, or fabricated equal.

ITEM 15 ICE MACHINE, 300 LB. QUANTITY AS SCHEDULED

Provide cube ice maker and bin having the following features:

ICE MAKER: 22" wide

- A. Capacity, based on 70 deg. F incoming water and 90 deg. F ambient, of approximately 320 pounds.
- B. Self-contained, air cooled.
- C. Electrical characteristics as scheduled.
- D. Stainless steel housing.
- E. Arrange to make dice cube ice.
- F. Mount ice maker on bin and install at location shown on drawings.
- G. Water filter.

BIN: 22" wide

- H. Manitowoc Bin B-420 to have capacity of approximately 310 pounds.
- I. Stainless steel exterior.
- J. 6" adjustable legs with flanged feet.

Ice machine to be as manufactured by Manitowoc, Model ID-0522A, Hoshizaki, or Scotsman.

ITEM 16 BEVERAGE COUNTER QUANTITY AS SCHEDULED

Provide stainless steel beverage table having the following features:

- A. 30" wide x 84" long, with 5" backsplash.

- B. 14 gauge stainless steel top with marine edges and reinforcing on underside.
- C. 1 5/8" diameter stainless steel legs.
- D. Stainless steel undershelf and intermediate shelf, each side of sink.
- E. Heavy duty casters with brakes.
- F. 18" x 18" x 10" sink with lever waste and T&S B-300 faucet.
- G. Center mount sink.
- H. 24" long drip trough, left side of sink.

Worktable to be as manufactured by Select Stainless, Model 7TCB-30-14-MOD, Universal, or fabricated equal.

ITEMS 17-20

NOT USED

END OF SECTION 114000

SECTION 12 22 14 - METAL DRAPERY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Metal Drapery

1.2 SUBMITTALS

- A. Product Data: For the following:
 - 1. Tracks: Include maximum weights of draperies that can be supported.
 - 2. Metal Fabric
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings:
 - 1. Tracks: Show installation and anchorage details and locations of controls.
 - 2. Draperies: Show sizes, locations, and details of installation.
- D. Samples: For each exposed product and for each finished required
- E. Maintenance data.

1.3 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before drapery fabrication, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design <MD-01>: Cascade Coil Drapery, Inc.
- B. Track
 - 1. Basis of Design: Curved Secura Track with small ceiling brackets and end stops
 - 2. Operation: Clear Anodized 72 inch batons.

3. Nylon wheel Bumper Carriers with self-pleating chain

C. Fabric

1. Basis of Design: Cascade Aluminum Mesh ALM020180
 - a. 1/8 inch 18 gauge
 - b. Finish: Clear Lacquered: Brite Pearl Gray
 - c. Wire Thickness: 0.0475
 - d. Provide 50% fullness
 - e. Opening Percentage: 57% minimum.

2.2 DRAPERY FABRICATION

- A. Fabricate draperies for installations indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install track systems according to manufacturer's written instructions, level and plumb, and at height and location in relation to adjoining openings as indicated on Drawings.
- B. Isolate metal parts of tracks and brackets from concrete, masonry, and mortar to prevent galvanic action. Use tape or another method recommended in writing by track manufacturer.
- C. After hanging draperies, test and adjust each track to produce unencumbered, smooth operation.

END OF SECTION

SECTION 12 24 13 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Recessed pocket mounted manual roller shades.
- B. Motor operated roller shades.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Include plans, elevations, sections, details, details of installation, operational clearances, wiring diagrams, and relationship to adjoining Work.
 - 1. Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 2. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.
- C. Coordination Drawings: Drawn to scale and coordinating penetrations and ceiling-mounted items.
- D. Samples: For each exposed finish and for each color and texture required.
- E. Roller-Shade Schedule: Use same designations indicated on Drawings.
- F. Maintenance data.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Fire-Test-Response Characteristics: Provide products passing flame-resistance testing according to NFPA 701 by a testing agency acceptable to authorities having jurisdiction.
- C. 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.
- D. Comply with WCMA A 100.1.

- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 ROLLER SHADES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product by MechoShade Systems, Inc or comparable product by one of the following:
 - 1. Draper Inc.
 - 2. Hunter Douglas Contract.
 - 3. Lutron Electronics Co., Inc.
- 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: Stainless steel]
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Clip, jamb mount.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Roller Mounting Configuration: Single roller
 - 2. Direction of Shadeband Roll: Regular, from back of roller.
 - 3. Shadeband-to-Roller Attachment: Manufacturer's standard method
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated, including recessed ceiling pockets.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- E. Shadebands:
 - 1. Shadeband Material: PVC-coated fiberglass
 - a. Colors: Light Grey 1010
 - b. Material Openness Factor: 2-3 percent.

2. Bottom (Hem) Bar: extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
 - b. Color and Finish: As selected by Architect from manufacturer's full range.

2.2 **MOTORIZED ROLLER SHADES**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product 1000 Series by MechoShade Systems, Inc. or a comparable product.
- B. Shade Bands
 1. Band Material: PVC-coated fiberglass
 - a. Colors: Light Grey 1010
 - b. Material Openness Factor: 2-3 percent.
 2. Bottom (Hem) Bar: extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
 - b. Color and Finish: As selected by Architect from manufacturer's full range.
- C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets. Provide capacity for two roller shade band(s) per roller.
- D. Direction of Roll: Regular, from back of roller
- E. Headbox: U-shaped, extruded aluminum; long edges returned or rolled; with a bottom cover consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or an openable, continuous metal access panel concealing shade roller, brackets, and operating hardware and operators within. Custom color to match aluminum curtain wall.
- F. Bottom Bar: Steel or extruded aluminum. Provide concealed, by pocket of shade material, internal-type.
- G. Mounting: Inside.
- H. Shade Operation: Motorized operator.
- I. Sun Sensors:
 1. Manufacturer designed continuously operating control system. System shall be comparable to MechoShades "SunDialer" System.
 2. Shall include a control module for controlling shade position and calculating shade position for optimum solar control
 3. Shall have the capability of aligning shades at up to 256 positions.
 4. Module shall calculate shade positioning every 60 seconds.
 5. Control module shall have capability of:

- a. Generating Reports and Analysis of solar conditions:
 - b. Data Storage.
 - c. Storage of Sensor Data.
 - d. Reporting of Control Zone activity.
 - e. Trending Reports, including Daily Reports, Shade Position Report, and Override Reports.
6. Override capability:
- a. Manual Override, via wall switches
 - b. Master Override of Sun Sensors at control module.

2.3 ROLLER SHADE FABRICATION

- A. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
- 1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
 - 2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- B. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting roller, and operating hardware and for hardware position and shade mounting method indicated.
- C. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

PART 3 - EXECUTION

3.1 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.
- B. Connections: Connect motorized operators to building electrical system.
- C. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- D. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

3.2 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain roller shades. Refer to Division 01 Section Demonstration and Training."

END OF SECTION

SECTION 12 48 16 - ENTRANCE FLOOR GRILLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Recessed floor grilles.

1.2 SUBMITTALS

- A. Product Data: For each type of floor grilles and frames.
- B. Shop Drawings: Show the following:
 - 1. Items penetrating floor grilles and frames.
 - 2. Divisions between grille sections.
 - 3. Perimeter floor moldings.
- C. Samples: For each floor grille and frame member.
- D. Maintenance data.

1.3 QUALITY ASSURANCE

- A. Accessibility Requirements: Provide installed floor mats that comply with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" And ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 FLOOR GRILLES

- A. Basis of Design: Subject to compliance with requirements, provide Gridline G6 by C/S Group. 1-1/8 inch Gridline with level base frame and hidden lockdowns.
- B. Stainless-Steel Floor Grille: Type 304.
 - 1. Surface Treads: 0.090-by-0.150-inch wire with 0.145-inch- openings between wires.
 - 2. Grille Size: As indicated on Drawings.
 - 3. Perimeter trim for finish transitions as indicated by Architect.

2.2 FABRICATION

- A. Shop fabricate floor grilles to greatest extent possible in sizes as indicated.
- B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install recessed floor grilles and frames to comply with manufacturer's written instructions at locations indicated and with top of floor grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set floor-grille tops at height for most effective cleaning action. Coordinate top of floor-grille surfaces with doors that swing across grilles to provide clearance under door.

3.2 PROTECTION

- A. After completing frame installations, provide temporary filler of plywood or fiberboard in floor-grille recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION

SECTION 12 93 00
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. Section Includes:
 - 1. Trash receptacles
 - 2. Bollards
- B. Related Requirements:
 - 1. Division 03 Section "Cast-in-Place Concrete" for concrete footings.
 - 2. Division 31 Section "Earth Moving" for excavation for installing concrete footings.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: for Bollards Type A and B.
- B. Product Data: For each type of product.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Samples for Initial Selection: For units with factory-applied finishes.
- E. Samples for Verification: For each type of exposed finish, not less than 6-inch- long linear components and 4-inch- square sheet components.
- F. Product Schedule: For site furnishings. Use same designations indicated on Drawings.
- G. Cairn Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Mockups: to remain until project completion for quality comparison.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For site furnishings.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Trash Receptacle Inner Containers: Five full-size units for each size indicated, but no fewer than two units.

PART 2 - PRODUCTS

2.1 TRASH RECEPTACLES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Hess America – Model PUNTO PN700 with side access and a capacity of 11.8 gallons.
- B. Trash:
 - 1. Receptacle Shape and Form: Round cylinder; with opening for depositing trash in top .
 - 2. Receptacle Height: 27.6”.
 - 3. Overall Height: 40.6”.
 - 4. Overall Width: 18.1”
 - 5. Inner Container: Polyethylene Rigid plastic container with drain holes and lift-out handles; designed to be removable and reusable.
 - 6. Capacity: Not less than 11.8 Gallons.
 - 7. Service Access: Hinged receptacle, side opening, keyed lock with two keys per receptacle.
 - 8. Post Mount: Galvanized steel pipe; for mounting one receptacle.
- C. Steel Finish: Galvanized and color coated.
 - 1. Color: Graphite Grey, as approved by Landscape Architect from submitted color samples.

2.2 BOLLARDS (TYPE A)

- A. Bollard Construction:
 - 1. Pipe OD: 8 inches.
 - 2. Material: Stainless steel.
 - 3. Style: As indicated.

4. Overall Height: As indicated.
5. Overall Depth: As indicated.
6. Installation Method: As indicated.

B. Stainless-Steel Finish: No. 6, Brushed satin.

2.3 BOLLARDS (TYPE B)

A. Bollard Construction:

1. Pipe OD: 6 inches.
2. Material: Schedule 80 steel.
3. Style: As indicated.
4. Overall Height: As indicated.
5. Overall Depth: As indicated.
6. Installation Method: As indicated.

B. Finish: Standard OSHA Yellow with primer coat.

2.4 MATERIALS

A. Steel and Iron: Free of surface blemishes and complying with the following:

B. Stainless Steel: Free of surface blemishes and complying with the following:

1. Sheet, Strip, Plate, and Flat Bars: ASTM A 666.
2. Pipe: Schedule 40 steel pipe complying with ASTM A 312/A 312M.
3. Tubing: ASTM A 554.

C. Anchors, Fasteners, Fittings, and Hardware: Stainless steel ; commercial quality, tamperproof, vandal and theft resistant , concealed, recessed, and capped.

1. Angle Anchors: For inconspicuously bolting legs of site furnishings to on -grade substrate; one per leg .
2. Antitheft Hold-Down Brackets: For securing site furnishings to substrate; two per unit .

D. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M; recommended in writing by manufacturer, for exterior applications.

E. 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.

2.5 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.

2.6 GENERAL FINISH REQUIREMENTS

- A. 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. 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.

2.8 STEEL FINISHES

- A. Primed and painted finish to be used for steel.

2.9 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run directional finishes with long dimension of each piece.
 - 2. Dull Satin Finish: No. 6.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.
- F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

3.3 INSTALLATION, GENERAL

- A. Do not use granite and sandstone with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.
- B. Mix stones from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut granite and sandstone with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
- D. Tolerances for Granite Plates: Do not exceed 1-inch unit-to-unit offset from flush (lippage) nor 1 inch in 24 inches and 1 inch in 10 feet from level, or indicated slope, for finished surface of paving. Intent is for horizontal surface to appear uneven or furrowed. Units shall expose smooth vertical surfaces..

- E. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
 - 1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after granite installation.
 - 2. For metal edge restraints with top edge exposed, drive stakes at least 1 inch below top edge.
 - 3. Where granite and sandstone set in mortar bed are indicated as edge restraints for pavers set in aggregate setting bed, install pavers set in mortar and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.
 - 4. Where granite and sandstone embedded in concrete are indicated as edge restraints for pavers set in aggregate setting bed, install pavers embedded in concrete and allow concrete to cure before placing aggregate setting bed and remainder of pavers. Hold top of concrete below aggregate setting bed.

3.4 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.
- C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

END OF SECTION 12 93 00

SECTION 12 93 00
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. Section Includes:
 - 1. Trash receptacles
 - 2. Bollards
 - 3. Post-Mounted Key Box for Bollard access
 - 4. Exterior Cairn
 - 5. Stainless Steel Bowl
- B. Related Requirements:
 - 1. Division 03 Section "Cast-in-Place Concrete" for concrete footings.
 - 2. Division 31 Section "Earth Moving" for excavation for installing concrete footings.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: for Bollards Type A and B.
- B. Product Data: For each type of product.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Samples for Initial Selection: For units with factory-applied finishes.
- E. Samples for Verification: For each type of exposed finish, not less than 6-inch- long linear components and 4-inch- square sheet components.
- F. Product Schedule: For site furnishings. Use same designations indicated on Drawings.
- G. Cairn Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Mockups: to remain until project completion for quality comparison.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For site furnishings.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Trash Receptacle Inner Containers: Five full-size units for each size indicated, but no fewer than two units.

PART 2 - PRODUCTS

2.1 TRASH RECEPTACLES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Hess America – Model PUNTO PN700 with side access and a capacity of 11.8 gallons.
- B. Trash:
 - 1. Receptacle Shape and Form: Round cylinder; with opening for depositing trash in top .
 - 2. Receptacle Height: 27.6”.
 - 3. Overall Height: 40.6”.
 - 4. Overall Width: 18.1”
 - 5. Inner Container: Polyethylene Rigid plastic container with drain holes and lift-out handles; designed to be removable and reusable.
 - 6. Capacity: Not less than 11.8 Gallons.
 - 7. Service Access: Hinged receptacle, side opening, keyed lock with two keys per receptacle.
 - 8. Post Mount: Galvanized steel pipe; for mounting one receptacle.
- C. Steel Finish: Galvanized and color coated.
 - 1. Color: Graphite Grey, as approved by Landscape Architect from submitted color samples.

2.2 BOLLARDS (TYPE A)

- A. Bollard Construction:
 - 1. Pipe OD: 8 inches.

2. Material: Stainless steel.
3. Style: As indicated.
4. Overall Height: As indicated.
5. Overall Depth: As indicated.
6. Installation Method: As indicated.

B. Stainless-Steel Finish: No. 6, Brushed satin.

2.3 BOLLARDS (TYPE B)

A. Bollard Construction:

1. Pipe OD: 6 inches.
2. Material: Schedule 80 steel.
3. Style: As indicated.
4. Overall Height: As indicated.
5. Overall Depth: As indicated.
6. Installation Method: As indicated.

B. Finish: Standard OSHA Yellow with primer coat.

2.4 KEY BOX AT BOLLARDS

- A. **IMPORTANT: Contact City of Jacksonville Fire Department** before ordering key box unit to coordinate with their master key system.
- B. Key Box Construction: heavy duty for commercial applications: 4" high x 5" wide x 3 ¾" depth, with hinged door, and with fittings that accommodate mounting to galvanized steel post. Weight of unit: approx. 10 pounds.
- C. Color of housing: black.
- D. Mounting: attached with manufacturer's bracket to a galvanized steel post as indicated in Drawings. All hardware shall be tamperproof.

2.5 EXTERIOR CAIRN

- A. Ashlar, Sedimentary Sandstone: Solid stone units resistant to freezing and thawing when tested according to ASTM C 67.
1. Diameter: 2'.
 2. Face Size and Shape: 66% solid stone face, 33% split face of stone in one unit. Units are laid as dry stack as indicated on drawings.
 3. Top of Fountain slab: Polished face
 4. Color: Gray tans as selected by Architect from manufacturer's full range.

2.6 STAINLESS STEEL BOWL

1. Overall Width: 24" diameter as indicated on Plans.
2. Overall Height: 3" as indicated on Plans.
3. Shape and Form; round with center hole.
4. Stainless-Steel Finish: Directional Satin No. 4.
5. Schedule 80 Steel Finish: OSHA yellow.

2.7 MATERIALS

- A. Steel and Iron: Free of surface blemishes and complying with the following:
- B. Stainless Steel: Free of surface blemishes and complying with the following:
 1. Sheet, Strip, Plate, and Flat Bars: ASTM A 666.
 2. Pipe: Schedule 40 steel pipe complying with ASTM A 312/A 312M.
 3. Tubing: ASTM A 554.
- C. Anchors, Fasteners, Fittings, and Hardware: Stainless steel ; commercial quality, tamperproof, vandal and theft resistant , concealed, recessed, and capped.
 1. Angle Anchors: For inconspicuously bolting legs of site furnishings to on -grade substrate; one per leg .
 2. Antitheft Hold-Down Brackets: For securing site furnishings to substrate; two per unit .
- D. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M; recommended in writing by manufacturer, for exterior applications.
- E. 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.

2.8 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.

2.9 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 ALUMINUM FINISHES

- A. 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.

2.11 STEEL FINISHES

- A. Primed and painted finish to be used for steel.

2.12 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run directional finishes with long dimension of each piece.
 - 2. Dull Satin Finish: No. 6.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.
- F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

3.3 INSTALLATION, GENERAL

- A. Do not use granite and sandstone with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.
- B. Mix stones from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut granite and sandstone with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
- D. Tolerances for Granite Plates: Do not exceed 1-inch unit-to-unit offset from flush (lippage) nor 1 inch in 24 inches and 1 inch in 10 feet from level, or indicated slope, for finished surface of paving. Intent is for horizontal surface to appear uneven or furrowed. Units shall expose smooth vertical surfaces..
- E. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
 - 1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after granite installation.
 - 2. For metal edge restraints with top edge exposed, drive stakes at least 1 inch below top edge.

3. Where granite and sandstone set in mortar bed are indicated as edge restraints for pavers set in aggregate setting bed, install pavers set in mortar and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.
4. Where granite and sandstone embedded in concrete are indicated as edge restraints for pavers set in aggregate setting bed, install pavers embedded in concrete and allow concrete to cure before placing aggregate setting bed and remainder of pavers. Hold top of concrete below aggregate setting bed.

3.4 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.
- C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

END OF SECTION 12 93 00

SECTION 13 12 13 – EXTERIOR FOUNTAINS

PART 1 - GENERAL

1.01 DESCRIPTIONS

- A. Provide a complete water feature system as shown on the drawings and specified herein. The work includes:
 - 1. Automatic water feature system including piping, fittings, nozzles and accessories.
 - 2. Water supply piping, valves, backflow preventor, and fittings.
 - 3. Direct burial vaults including piping and wiring, pumps, motors, controls, isolation & balancing valves, basket strainers, auto fill manifolds, electrical controls, and filtration system.
 - 4. Drain and waste piping, valves and strainers.
 - 5. System start-up, adjustment, and testing.
 - 6. Excavating and backfilling water feature system work
 - 7. Associated exterior plumbing, wiring, and accessories to complete the system.
 - 8. Piping water stop fittings.
 - 9. Concrete reservoir with access hatches and all waterproof penetrations.
 - 10. Granite Fountain Slab
- B. Related requirements specified elsewhere:
 - 1. General requirements and Alternates: Division 1 sections.
 - 2. Earthwork: Section 312000
 - 3. Pool Concrete Construction: Section 033053

1.02 QUALITY ASSURANCE

- A. Provide a complete water feature system as supplied by a single source manufacturer and designer of decorative fountains and water features.
- B. Substitutions of water feature materials shall require written approval by the Architect. Installers offering substitutions shall submit three (3) copies of the following at least ten (10) working days prior to the bid date for review and approval.
 - 1. Complete water feature system flow diagram.
 - 2. Complete water feature electrical control panel ladder logic diagrams.
 - 3. A complete bill of materials along with specifications cuts of proposed substitute items.
 - 4. A written description of the water feature's operational system.
 - 5. A written performance guarantee by the alternate system manufacturer certifying that the alternate system will meet the specified performance requirements.
 - 6. Failure to submit for prior approval of substitutions will be grounds for rejection.

7. Manufacturer's qualification: The firm shall have a minimum of 15 years experience with a satisfactory record of performance for designing, supplying, and completing fountains and water features of comparable size and complexity. Workmanship and equipment shall be of the highest quality.
- D. Materials, equipment, and methods of installation shall comply with all applicable codes and standards including:
 - a. National Fire Protection Association (NFPA), National Electrical Code.
 - b. American Society for Testing and Materials, (ASTM).
 - c. National Sanitation Foundation, (NSF).
 - d. Underwriters Laboratories, (UL).
 - di. NC Building Code
- E. Excavating, backfilling, and compacting operations: Comply with requirements as specified in Section 02300 Earthwork. Coordinate with owner to obtain this section.
- F. Obtain in writing Landscape Architect's acceptance of installed and tested fountain system.

1.03 SUBMITTALS

- A. Submit the following:
 1. Manufacturer's Literature: Materials and installation instructions for each of the system components.
 2. **Delegated Design - Shop Drawings:** Shop drawings for the complete water feature system. Include piping layout and details illustrating location and types of water feature specialties, valves, controls, wiring and list of equipment.
 3. Material samples: Furnish upon request.
 4. Operations and Maintenance Manual:
Prior to final inspection and system acceptance, submit written operating and maintenance instructions and obtain Landscape Architect's approval for same in writing. Provide to Owner's appointed maintenance personnel instruction in proper use, programming and monitoring of system.
- B. Provide water feature system record drawings.
 1. Legibly mark drawings to record actual construction.
 2. Indicate all fountain components with both horizontal and vertical locations referenced to permanent surface improvements using system plans as base sheets. Submittals shall include three (3) sets of prints.
 3. Identify field changes of dimension, piping, basin, any detail and changes made by Change Order.
 4. Identify each nozzle and light set as corresponds to valve and circuit.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver system components in manufacturer's original undamaged and unopened containers with labels intact and legible.
- B. Deliver plastic piping in bundle, packaged to provide adequate protection of pipe ends, both threaded and plain.
- C. Store and handle materials to prevent damage theft, and deterioration.
- D. Provide secure, locked storage for valve, nozzles, lights, and similar components that can not be immediately replaced, to prevent installation delays.

1.05 WATER FEATURE DESCRIPTION

- A. **FOUNTAIN**
The fountain consists of a broad granite slab with an input weir at the top edge. The water is pumped over this weir and flows in a sheet across the slab to a linear drain at the base of the slab.
- B. **CONTROLS**
The controls for the fountain will be provided in a UL Listed control panel located in an underground equipment vault. Each panel will have a Programmable Logic Controller, PLC, which will provide time clock, water level, motor speed and other specified functions.
- C. **RELAY CONTROLS**
Mounted as indicated on the plans, provide a remote control relay system that provide basic operational overrides to the default control system in the vaults.

1.06 PROJECT CONDITIONS

- A. The contractor shall, at his expense, locate, excavate and verify the alignment and depth of all underground utilities as shown or inferred on the drawings. Protect existing utilities, paving, and other facilities from damage caused by fountain installation operations.
- B. Promptly repair damage to adjacent facilities caused by fountain system work operations. All damage to adjacent facilities resulting from work covered in these specifications will be repaired at the Contractor's expense.
- C. Protect new and existing trees, plants, lawns, and other features designated to remain as part of the final landscape work.
- D. Promptly repair damage to finish grades, lawn areas, and planting caused by fountain system work operations. All damage to grades, lawns and planting resulting from work covered in these specifications will be repaired at the Contractor's expense.
- E. Promptly notify the Landscape Architect in writing of unexpected sub-surface conditions.
- F. Coordinate water feature work with other trades to avoid conflicts and permit all trades to perform their work in a timely manner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General

1. Where practical, the product of a single manufacturer for each type of material shall be used throughout all work specified under this section.
2. Provide all special tools required for proper operation and maintenance of equipment provided under this section. Deliver to Owner.
3. Furnish three hard back, three-ring binders containing all bulletins, operating and maintenance instructions and parts lists and other pertinent information for each and every piece of equipment furnished under this section. Include service telephone number. Index binder into sections and label for easy reference. Deliver to Owner.
4. Provide factory personnel for start-up supervision and a minimum of four hours training of Owner's staff.

B. Equal Products:

Bidders desiring to substitute products different than those specified in this Section, must receive written approval from the Landscape Architect. In order to be considered as equals, a written request accompanied by all appropriate product data, samples, test results, and certifications must be submitted to the Landscape Architect a minimum 14 days prior to the bid due date. Products deemed to be acceptable will be included by Landscape Architect written acceptance.

C. Pipe and Fittings:

1. All pipe and fittings shall be identified by the manufacturer to indicate material, class or type, size and pressure rating.
2. Copper tube and fittings:
Tube: Type L seamless, conforming to ASTM B-88.
Drawn temper for use with solder type fittings.
Dead soft for use with compression fittings, conforming to ASTM B-75.
Fittings: Wrought copper or cast bronze solder joint type fittings conforming to ASTM B-75 and ANSI B16.22. Brass compression fittings for copper tubes conforming to SAE CA377 and SAE CA360.
3. Brass pipe and fittings:
Pipe: Standard weight, conforming to ASTM B-43, threaded ends.
Fittings: Class 125 cast bronze threaded conforming to ASTM B-62 and ANSI 16.22.
4. PVC pipe and fittings:
Pipe: Standard schedule 40 or 80, as specified, conforming to ASTM-D-1785 and ANSI B16.15.
Fittings: Standard schedule 40 or 80, as specified. Schedule 40, socket welded connections shall conform to ASTM-D-2466, threaded connections may not be used. Schedule 80, socket welded connections shall conform to ASTM-D-2467, threaded connections shall conform to ASTM-D-2462. Solvent cement shall conform to ASTM-D-2564.

D. Valves

1. Ball Valves
PVC, full-port ball valve, tru-union fittings, Pressure rated to 150 P.S.I. at 70°F, As manufactured by Simtech, or approved equal.
2. Solenoid Valve (Fill)
Bronze 2-way pilot operated diaphragm valve with 120 volts solenoid, with bleed screw to provide to provide manual operation and closing speed adjustment. Valve shall not be fast acting. Wattage 7 - minimum P.S.I. 5, maximum P.S.I. 150.
3. Butterfly Valve
125/150# Lug type cast iron BFV of uni-body construction with one piece extended neck, EPDM resilient seat molded in o-ring, nylon coated disc, and stainless steel stem. 5" or smaller shall be lever operated, 6" and larger shall be gear operated.
4. Check Valve
Flanged horizontal elastic swing check valve having a ductile iron, 125# body, and cover, epoxy coated on the inside. The disc shall be one-piece molded buna with steel insert for positive closure. A 100% uninterrupted flow is available in the open position.
5. Check Valve
Threaded, bronze swing check valve.
6. Bronze Ball Valve
Threaded two (2) piece bronze body, standard port openings, blow out proof stem, TFE packing with adjustable stem packing gland, free floating chrome plated brass ball.

E. Pumps & Filters

1. Feature Pump – per delegated design submittal.
2. VFD (Variable Frequency Drive) – per delegated design submittal.
2. Filter Pumps-per delegated design submittal.
3. Filters - per delegated design submittal.

F. Specialties

1. Basket Strainer
Cast iron flanged basket strainer with quick release cover with o'ring seal and stainless steel basket with 3/8" perforations.
2. Water Level Sensor
Conduit mount electronic water level sensor with quick fill, safe-off, and maxi level control combination, float housing to have 3/4" conduit connection and be made from extruded plastic; brass, copper, and stainless steel fitted. Gasket and seal shall be neoprene. Level switch shall be reed relay enclosed in plastic, magnetically actuated float with 1" (25mm) level adjustment. Voltage: 12VAC, .05Amp. Non-inductive.

3. Copper Fill Loop:
Copper fill loop manufactured from 1½" copper pipe. Unit to include: 110V, 1" solenoid fill valve, brass unions, brass by-pass and isolation valves, hose bib and water hammer arrestor. Loop provided completely assembled with threaded female connections and leak tested.
4. PVC Waterstop Couplings
SCH 80 PVC coupling with 3/8" thick PVC flange welded all around on both sides.
5. Chlorinator
An in-line chlorinator shall be installed in the vault, in the filter return line. Unit shall be totally sealed when in normal operation and have adjustable feed rate dial. A 20# supply of 1" Chlorine tablets and a chlorine test strip kit shall also be furnished.
6. Pressure Gauges
Stainless steel case, 2½" liquid filled pressure gauges with ¼" bottom connection. Gauges shall be sized for operation at approximately 50% of full scale. Combination gauges shall be installed on suction of display pumps. Pressure gauges shall be installed on discharge of display pumps and on manifolds.
7. Direct Burial Vaults
Direct burial pumping system vault with 2½" thick fiberglass laminated foam filled walls with steel support beams for the floor and roof. System shall be factory designed, fabricated and tested with all mechanical and electrical equipment furnished and installed at the factory. Unit shall be provided with slip and or threaded connections externally for all pipe and conduit connections. Unit shall be as sized on contract drawings and of all fiberglass-reinforced construction, with black fiberglass access hatch, aluminum access ladders. Unit shall contain feature pumps, vault sump pump, filters, UV sterilizers, in-line chlorinators, thermostatically controlled forced air vent system with cast iron vent caps, overhead light, GFI outlet, auto-fill system, control panel.
8. Ultra-Violet Sterilizer
One 2" , 400 watt PVC, high efficiency ultra-violet sterilizer. Units shall have one high efficiency lamp with easy access for replacement. Each sterilizer shall have flow switch. Control unit shall be 120 volt, 1 phase, 60 hz.
9. Float Switches
The Eco-Float is a mercury-free float switch for controlling liquid levels in a variety of applications. A snap-action switch is activated by a steel ball rolling back and forth within a switching tube in a plastic float housing. There is a minimum differential between "on" and "off" of approximately 3.5 inches. Greater differentials can be achieved when the pipe mounted or externally weighted mounting styles are used. Various lengths of cable and circuit configurations are available and in stock.
10. Anti-Vortex Plates
Plate shall be cast bronze construction 15" in diameter 3/16" thick with 1 ½" legs. Plate to have holes drilled for anchoring to floor.
11. Niche Mounted Fountain Light

U. L. Listed, 35W, 12V niche mounted light as shown on drawings. Heavy duty, all cast bronze fixture with clear tempered lens, brass watertight cord entrance, thermal cut-off, epoxy encapsulated, stainless steel niche and supplied with cord for proper installation. Fixture supplied with 35 watt lamp installed.

- 12.. U.L. Listed Deck Mount Junction Box:
Box to be of heavy cast bronze construction with neoprene gasket, internal ground lugs and silicone bronze or stainless steel hardware.
13. Junction Box Cord Seals:
Construction of threaded connector, compression nut, and friction washer shall be brass with neoprene molded compression seal.
20. Stand Pipe Overflow Drain:
Combination overflow and pool drain body, reversible clamp collar, adj. Extension, tapered watertight slip connection and vented dome shall be cast bronze. Standpipe shall be copper, fasteners shall be stainless steel.

G. Fountain Control Panel

1. Fountain Panel - Panel shall be U.L. listed and of a unified design with all electrical control components installed and pre-wired to coded terminal strip. Panel shall include: control and lighting power distribution panelboard; control breakers including GFCI's; control and lighting relays and contactors; motor starters with thermal overload protection, programmable controller, selector switches, all in a NEMA 4X, fiberglass enclosure.
 - (a) Panelboards:
Shall be U.L. Listed and meet Federal Specification W-P- 115b, Type 1, Class 1 and as follows:
Designed for plug-on type circuit breakers.
Rated for minimum 10,000 amps RMS short circuit current.
Furnished in single phase 3 wire main lugs as specified.
 - (b) Circuit Breakers:
Breakers shall be U.L. Listed and as follows:
Designed for plug-on installation.
Rated for minimum 10,000 amp RMS interrupting capacity.
Provide visible trip indication.
Ground fault circuit interrupter breakers shall be Class "A" designed for "people protection" and rated to trip when a fault current to ground is 6 milliamperes or more.
Breakers shall be, THQL Series, THQLGF.
 - (c) Selector Switch U.L. Listed:
Shall be selected and sized as necessary .
Switches shall be U.L. Listed.
Switches shall be as follows:
Designed for oiltight/watertight operation.
Non-illuminated with black knob operator and legend plate.
Provided with 10 amp contact blocks. Series DT-5.
 - (d) Indicator Pilots:
Indicator pilots shall be installed and pre-wired in Control

Panels and shall be selected and sized as necessary and as manufactured by S & S, series DT-5, or approved equal.
Pilots shall be U.L. Listed.

Pilots shall be as follows:

Designed for oiltight/watertight operation.

Full voltage style and furnished with lamp and color cap.

(e) Programmable Logic Controller:

PLC shall be door mounted and preprogrammed to function as time clocks, wind sensor, level control supervisor, and relay controller and valve sequencer. Two-line display shall alarm functions, such as low water. Unit shall have nine digital inputs, six digital outputs and one analog input. Additional digital and analog outputs shall be supplied with necessary expansion modules. Time settings are made from keypad. Shall have RS-485 communication Port and RS232 port for programming.

(f) Control Relay shall be U.L. Recognized:

Shall be selected and sized as necessary.

General purpose control relays shall be as follows:

Contacts rated at 10 amps. Type KP.

(g) Panel Enclosure:

Enclosures rated NEMA 4X shall be as follows:

Construction: Fiberglass reinforced plastic molded housing.

Door: Hinge mounted, clamp secured and furnished with hasp and staple to padlocking.

Gasket: Oil-resistant attached with oil-resistant adhesive and held in place with steel retaining strips.

Back plate: Steel and mounted on raised studs.

H. Granite Fountain Slab

Granite: Solid plates resistant to freezing and thawing when tested according to ASTM C 67, made from reclaimed granite countertops.

Thickness: 2" minimum depth.

Face Size and Shape: Width varies from 6' minimum to 8' maximum. Length varies from 10' minimum to 17' maximum. Units are laid with 1/4" caulk joint between adjacent granite slabs as indicated on drawings.

Finish: Polished face with ridges

Color: Dark to Medium Gray / Black as selected by Architect from manufacturer's full range.

Setting: Latex mortar cement

PART 3. EXECUTION

3.01 GENERAL

- A. Install all equipment specified herein and/or shown on the drawings in strict accordance with the manufacturer's instructions and recommendations unless otherwise noted.

3.02 PREPARATION

- A. The Contractor shall be held to have visited the site and to have compared the same with the drawings and specifications covering this work, and to have satisfied himself with the conditions existing at the site and/or shown on the drawings which affect or are affected by the work, and as to all other matters which may be incidental to the work described in these specifications and/or shown on the drawings before delivery of this Bid. He shall assume all responsibility thereafter.

3.03 INSTALLATION

A. Pipe

1. Provide flanges or unions as indicated and as necessary to allow reinstallation of any item of equipment or accessory without cutting, welding or soldering.
2. Cut pipe into measurements established at the site. Work into place without springing or forcing.
3. Protect all openings in piping during construction to prevent entrance of foreign matter.
4. Cut pipe and tubing ends square. Remove rough edges and burrs so that a smooth and unobstructed flow will be obtained.
5. Close or short nipples should be used only where shown on the Drawing, are absolutely necessary to satisfy dimensional constraints.
6. Make changes in pipe size using reducing fittings. Use bushings only if shown on the Drawings.
7. Connections to equipment or accessories shall be screwed for sizes 2" smaller, flanged for sizes 2-1/2" and larger.
8. Arrange exposed piping straight, parallel and perpendicular to the walls of the structure unless, otherwise shown on the Drawings.
9. Whenever two or more pipes are installed in parallel, allow sufficient space for required welding, soldering, painting, and/or the application of insulation.

B. Granite Fountain Slab

1. Do not use granite and sandstone with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.
2. Cut granite and sandstone with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
3. Tolerances for Granite Plates: Do not exceed 1-inch unit-to-unit offset from flush (lippage) nor 1 inch in 24 inches and 1 inch in 10 feet from

level, or indicated slope, for finished surface of paving. Intent is for horizontal surface to appear uneven or furrowed. Units shall expose smooth vertical surfaces.

4. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
 - a. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after granite installation.
 - b. For metal edge restraints with top edge exposed, drive stakes at least 1 inch below top edge.
 - c. Where granite and sandstone set in mortar bed are indicated as edge restraints for pavers set in aggregate setting bed, install pavers set in mortar and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.
 - d. Where granite and sandstone embedded in concrete are indicated as edge restraints for pavers set in aggregate setting bed, install pavers embedded in concrete and allow concrete to cure before placing aggregate setting bed and remainder of pavers. Hold top of concrete below aggregate setting bed.

C. Pipe Joints:

1. Cut all threads accurately, axis of thread coinciding with axis of pipe.
2. No more than two threads shall show beyond fittings.
3. Make up joints with Teflon tape or pipe dope compound.
4. Remake leaky joints with new materials.

D. Copper and brass pipe and tubing:

1. Clean surfaces to be jointed of oil, grease, rust, and oxides before assembly or heating.
2. Apply an appropriated flux to each joint surface and spread evenly. Apply heat with an oxyacetylene torch.
3. Make up all joints using non-corrosive flux and 95-5 solder, ASTM B32 Grade A.

E. PVC pipe:

1. Bevel all pipe ends with a coarse file or beveling tool.
2. Clean surfaces to be joined of all loose dirt and moisture from the I.D. and O.D. of the pipe end and the I.D. of the fitting socket.
3. Apply a coating of appropriate primer to the entire I.D. surface of the fitting socket and to an equal area on the O.D. of the pipe end.
4. Apply solvent cement using an appropriate natural bristle brush as follows:
 - a. Apply a liberal coating of cement around the entire depth of the sockets surface, avoiding excessive cement application.
 - b. Apply a second liberal coating onto the pipe end.

- c. Immediately after cementing, insert the pipe into the fitting to the full socket depth while rotating the pipe or fitting one quarter turn. Hold joint together for at least 15 seconds after joining to make sure pipe does not back out of socket.
5. Do not solvent weld pipe if atmospheric temperature is below 40 degrees F or above 90 degrees F, or if it is raining.
6. Discard cement when an appreciable change in viscosity takes place or if cement is lumpy or stringy. Do not thin. Cement must be used before the expiration date shown on container.
7. All systems shall be left in good operating condition. If defects of materials or workmanship in piping systems or equipment are disclosed as a result of operational test, repairs shall be made by the Contractor, using new materials, and all defective materials shall be replaced, until a satisfactory test has been made.
8. No caulking or screwed joints, cracks, or holes will be acceptable. Replacing shall be the full length of defective sections of pipe. Defective apparatus shall be removed from the site and replaced by apparatus conforming to the requirements of this section. The entire cost of repairs and replacements shall be borne by this Contractor.

F. Wiring Materials

1. Electrical conductors connected to equipment having a tendency to cause noise or vibration, shall be installed in flexible conduit not to exceed four feet in length. All flexible conduit subject to moisture shall be covered with watertight plastic and all connections shall be made with watertight fittings.
2. All other electrical conductors shall be installed in rigid conduit unless otherwise specified or indicated on the drawings. All connections shall be made with approved fittings.
3. All conduit located within the pool and all stub-ups through the pool floor shall be red brass pipe, type K copper tubing of full hard temper, or Everdur.
4. All interconnecting conduits outside the pool shall be, P.V.C. or other material approved for application.
5. All connections between dissimilar metals shall be made with dielectric fittings.
6. Minimum conduit size shall be 3/4" unless otherwise specified or indicated on the drawings.
7. All wire, flexible cord, cable and/or conductors shall be selected as to size, type, current carrying capacity, voltage and insulation based on intended service, and shall conform to the latest ASTM and IPECA specifications and standards.
8. All connecting and terminating devices used for making connections, taps and/or splices shall be as approved for application.

9. All junction and/or pull boxes located outside the pool shall conform to applicable codes and shall be of sufficient size, suitable design and approved construction to meet the conditions and requirements involved.

G. Installation of Conduit

1. All wiring shall be in conduit installed and sealed in accordance with the best modern practice, except that flexible cord approved for submersible application shall be used between underwater pool light fixtures and underwater junction boxes.
2. All conduit located in finished areas shall be concealed unless otherwise specified or indicated on the drawings.
3. The ends of all conduits shall be cut square and shall be carefully reamed to remove rough edges.
4. Open ends of conduit shall be kept closed with approved conduit seals during construction.
5. Where conduit enters a box or other fitting, a bushing shall be provided to protect conductors from abrasion.
6. Where junctions, bends, or offsets are required, for exposed runs of conduit, fittings shall be provided. Fitting covers shall be accessible. Bends will not be permitted around corners of beams, walls, or equipment.
7. Threadless couplings and/or connectors used with conduit shall be made tight. Where installed in wet locations or where buried in concrete or other fill, threadless couplings and connectors shall be suitable for preventing water from entering the conduit. Running threads will not be permitted.
8. Sliding expansion joints with bonding straps shall be furnished where conduits cross building expansion joints or as otherwise required.
9. Bends in conduit shall be made so that the conduit is not damaged and such that the inside diameter of the conduit will not be effectively reduced. No more than the equivalent of four 90-degree bends shall be used on any single run of conduit between outlets and/or other fittings.
10. All concealed and/or exposed conduit shall be supported in an approved manner.

H. Installation of Conductors

1. All conductors shall be installed in conduit after all conduits, except exposed conduit with removable conduit seals, have been installed as a complete raceway system.
2. All debris and moisture shall be removed from all conduit, boxes, and other fittings before installing conductors. Cleaning agents or materials used as lubricants that might have a deteriorating effect on conductor coverings shall not be used.

3. The connection of conductors to terminals shall be made using approved connectors. Wires in panel cabinets, pull boxes, and wiring gutters shall be neatly grouped and fanned out to the terminals.
4. Care shall be taken to protect conductors from damage caused by further mechanical work completed after conductors have been installed. Damaged conductors shall be replaced.
5. All circuits fed by ground fault interrupters shall have their own separate neutral wire. No common neutrals will be acceptable.

I. Conductor Color Coding

1. All conductors (600 volts and under) shall be color-coded and identified by one color with continuity being maintained throughout the project.
2. Color-coding shall be as follows: Phase "A" shall be "Black", Phase "B" shall be "Red", Phase "C" shall be "Blue", "Neutral" shall be "White", and "Grounding Conductors" shall be "Green".

J. Excavating, Trenching and Backfilling

1. The Contractor shall perform all excavating, trenching and backfilling specified, as indicated on the plans and/or as required for the installation of the work under this section, according to Section 0312000 Earthwork. Obtain Section 0312000 from owner.
2. Trenched shall be excavated and underground conduit shall be laid and supported in accordance with Section 0312000 Earthwork and as indicated on the Landscape sheets.
 1. Prior to lowering into the trenches, all conduit fittings and accessories shall be inspected for defects and all defective, damaged or unsound conduit shall be replaced.

3.04 TEST AND ADJUSTMENTS

- A. This Contractor shall test all equipment installed by him, as necessary, to show that it complies with all requirements specified. Testing shall be done in a manner approved by the Architect/Engineer.
- B. All water piping systems shall be pressure tested at 150% of operating pressure or 75psi minimum and proven free of leaks or other defects for a minimum of four hours. Tests shall be performed prior to and after backfilling and concrete pours.
- C. All electrical circuits, feeders, and equipment shall be tested and proven free of improper grounds, open circuits or shorts, as required by the public authorities, to demonstrate compliance with codes or laws.
- D. The Contractor shall place the installation in operation and make tests, adjustments, and corrections, until it is shown to be in proper operating condition.

3.05 GUARANTEE

- A. In entering into a contract covering this work, each contractor accepts the specifications and drawings and guarantees that the work will be performed in accordance with the requirements of the specifications and drawings, or such modifications to said specifications and drawings, as may be made in the contract documents.
- B. Each Contractor further guarantees that the workmanship and material will be of best quality procurable, and that experienced workmen, familiar with each particular class of work, will be employed.
- C. Each Contractor further agrees to hold himself responsible for any defects which may develop in any part of the entire system, including equipment as provided for under this specification, due to faulty workmanship, design or material and to replace and make good, without cost to the Owner, any such faulty parts or construction that may develop at any time within one year from the date of the final acceptance. Any repairs or replacements required because of defects, as outlined in this clause, are to be made promptly and approved in writing by the Architect/Engineer.

3.06 CLEAN-UP

- A. Upon completion of the work of this section, the Contractor shall remove from the sites all rubbish, trash, and debris resulting from the operations, remove all equipment and implements of service, and leave the entire work area unused in a neat, clean, and acceptable condition as approved by the Owner.
- B. All soiled, abraded or discolored surfaces of decorative fountain work shall be cleaned, polished and left free from blemishes or defects.
- C. All water pipe lines shall be flushed free of debris.

END OF SECTION