



JAMES BROWN ARENA

Bell Auditorium
Expansion & Renovations

Project Manual
Volume 1 of 2

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PROFESSIONAL SEALS PAGE

The following Documents and Specification Sections have been prepared by or under the direct supervision of the Architect:

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01/16/2023

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The following Specification Sections have been prepared by or under the direct supervision of the Civil Engineer:

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The following Specification Sections have been prepared by or under the direct supervision of the Electrical Engineer:

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The following Specification Sections have been prepared by or under the direct supervision of the Fire Suppression Engineer:

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SPECIFICATIONS

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The following Specification Sections have been prepared by or under the direct supervision of the Landscape Architect:

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The following Specification Sections have been prepared by or under the direct supervision of the Mechanical Engineer:

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SPECIFICATIONS

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SPECIFICATIONS

- 22 05 00 Common Work Results for Plumbing
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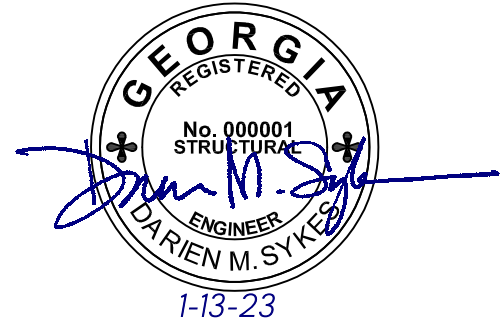
PROFESSIONAL SEALS PAGE

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1.1 GEOTECHNICAL DATA

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.
- B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.
- C. Soil-boring data for Project (B-8, B-9, B-10), obtained by NOVA Engineering and Environmental, LLC dated January 22, 2021, is available for viewing as appended to this Document.
- D. A geotechnical investigation report for Project, prepared by NOVA Engineering and Environmental, LLC dated March 29, 2021, is available for viewing as appended to this Document.
 - 1. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
 - 2. Any party using information described in the geotechnical report shall make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.
- E. Related Requirements:
 - 1. Document 00 21 13 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
 - 2. Document 00 31 19 "Existing Condition Information" for information about existing conditions that is made available to bidders.
 - 3. Document 00 31 26 "Existing Hazardous Material Information" for hazardous materials reports that are made available to bidders.

END OF SECTION 00 31 32

PRELIMINARY GEOTECHNICAL ENGINEERING REPORT



James Brown Arena
Augusta, Richmond County, Georgia

PREPARED FOR:
H.J. Russell & Company
171 17th Street, NW
Atlanta, Georgia 30363

NOVA Project Number: 10103-2021003

March 29, 2021



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March 29, 2021

H.J. Russell & Company
171 17th Street, NW
Atlanta, Georgia 30363

Attention: Mr. H.B. Brantley, S.P.A.C.E. Venues Group
Managing Sports Principle/ Project Executive Consultant

Subject: Preliminary Geotechnical Engineering Report
JAMES BROWN ARENA
Augusta, Richmond County, Georgia
NOVA Project Number 10103-2021003

Dear Mr. Brantley:

NOVA Engineering and Environmental, LLC (NOVA) has completed the authorized Geotechnical Engineering Report for the proposed James Brown Arena in Augusta, Georgia. The work was performed in general accordance with NOVA Proposal Number 003-20210327 dated January 14, 2021. This report briefly discusses our understanding of the project at the time of the subsurface exploration, describes the geotechnical consulting services provided by NOVA, and presents our findings, conclusions, and recommendations.

We appreciate your selection of NOVA and the opportunity to be of service on this project. If you have any questions, or if we may be of further assistance, please do not hesitate to contact us.

Sincerely,
NOVA Engineering and Environmental, LLC

Michael W. Mckenzie, E.I.T.
Project Engineer

Marc D. Johnston, P.E.
Regional Manager
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Copies Submitted: Addressee (electronic)



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- Appendix C – Laboratory Data
- Appendix D – Qualifications of Recommendations

1.0 INTRODUCTION

1.1 PROJECT INFORMATION

Our understanding of the requirements of the project is based on our conversations with Mr. HB Brantley with H.J. Russell & Company and review of the provided project documents, as well as our experience with similar projects. The Subject Property is located at the James Brown Arena in Augusta, Richmond County, Georgia.

The Subject Property currently consists of the existing James Brown Arena, Bell Auditorium, and associated parking and driveway areas and open lawn landscape areas.

1.1.1 Site Plans and Documents

We were furnished with the following plans and documents:

- James Brown Arena Scope of Services for Geotechnical Investigation and Report, Provided by H.J. Russell & Company, Dated January 8, 2021.
- Preliminary Foundation Notes, Prepared by Walter P. Moore / Sykes Consulting, Dated January 12, 2021.
- Existing Lobby Level Framing Plan and Foundation Drainage Plan, Prepared by I.M. Pei & Partners, Architects, Dated February 2, 1977.

1.1.2 Proposed Structures

The proposed construction is for a 10,000 seat, multi-purpose arena with a covered connector to the adjacent Bell Auditorium. The connector will be constructed immediately adjacent to the existing Bell Auditorium. The existing arena will be demolished, and the existing basement level will be backfilled. Surface parking and some site foundation walls will be constructed as well.

1.1.3 Maximum Loads

Structural loading information was provided as of the time of this exploration and report. Typical interior column loads include dead loads of 425 kips and live loads of 275 kips. Typical column supporting long-span roof loads include dead loads of 625 kips and live loads of 325 kips. We assume soil-supported ground floor loads (live loads) in the new buildings will not exceed 125 pounds per square foot (psf).

1.1.4 Floor Elevations / Site Grading

Detailed grading information was not provided at the time of this report; however we understand that the proposed finished floor elevation for the new arena level will be 141 feet-MSL and the proposed finished floor elevation for the Bell Auditorium connector will be 133.27 feet-MSL. The existing arena basement level has a finished floor elevation of approximately 122 feet-MSL and will require fills of up to 20 feet to achieve proposed finished grades after demolition. We anticipate that the existing site ground surrounding the arena are close to proposed finished grades and will only require minor fine grading.

1.2 SCOPE OF WORK

H.J. Russell & Company engaged NOVA to provide the geotechnical engineering consulting services for the James Brown Arena in Augusta, Georgia. This report briefly discusses our understanding of the project, describes our exploratory procedures, and presents our findings, conclusions, and recommendations.

The primary objective of this study was to perform a geotechnical exploration program within the area of the proposed building construction and to assess the findings obtained as they relate to geotechnical aspects of the planned arena. The authorized geotechnical engineering services provided included a site reconnaissance, a soil test boring and sampling program, engineering evaluation of the field and laboratory data, seismic class determination and the preparation of this geotechnical Engineering report.

The services were performed as outlined in NOVA Proposal Number 003-20210327 dated January 14, 2021, and in general accordance with industry standards.

As authorized per the above referenced proposal, the completed geotechnical report was to include:

- A description of the site, field services, laboratory testing and general soil conditions encountered, as well as a Boring Location Plan, individual Boring Records, and boring elevations and coordinates;
- Discussion on potential design/construction issues indicated by the exploration, such as materials that would require difficult excavation techniques, shallow groundwater table, unsuitable materials, etc, with special attention to issues related to the demolition, removal, and backfill of the existing basement structure;
- Suitability of on-site soils for re-use as structural fill and backfill. Additionally, the criteria for suitable fill materials will be provided. Soil compaction requirements for foundations, structural fill and pavements will also be

provided. The potential use of on-site asphaltic material as recycled backfill material will be discussed;

- Recommendations for controlling groundwater and/or run-off during construction and, the need for permanent de-watering systems based on the anticipated post construction groundwater levels, along with dewatering system design and documentation services;
- Recommendations for foundation design and construction, including allowable bearing pressure capacities, bearing depths, and coefficient of friction to resist sliding;
- Estimate of total and differential settlements of foundation based on available structural loading data;
- An evaluation of feasible deep soil improvement methods that may be required to reduce shallow foundation settlements to tolerable levels, *if necessary*;
- A recommended deep foundation alternative, including estimated allowable compression, tensile, and lateral loads as well as estimated foundation embedment lengths, *if necessary*;
- Slab-on-grade construction considerations based on the geotechnical findings, including the need for a sub-slab vapor barrier or a capillary barrier and modulus of subgrade reaction;
- Underslab drainage design and drawings, if necessary;
- Recommendations for lateral earth pressure coefficients for the design of below-grade walls using select fill soil and stone backfill;
- Recommendations for temporary and permanent slopes;
- Pavement design and preparation recommendations based on provided traffic loading information, axle loads and traffic counts, and an estimated soil support value;
- Seismic site classification per ASCE 7-16, including S_s and S_1 values;
- S_{DS} and S_{D1} based on the results of the seismic risk-based hazard analysis; and
- Recommended quality control measures (i.e. sampling, testing, and inspection requirements) for site grading and foundation construction.

The assessment of the presence of wetlands, floodplains, or water classified as State Waters of Georgia was beyond the scope of this study. Additionally, the assessment of site environmental conditions, including the detection of pollutants in the soil, rock, or groundwater, at the site was also beyond the scope of this geotechnical study.

2.0 SITE DESCRIPTION

2.1 LOCATION AND LEGAL DESCRIPTION

The Subject Property is located in downtown Augusta, Georgia, on the parcel bounded between 7th Street and 8th Street, and Fenwick Street and Telfair Street. According to the Augusta GIS database, the Subject Property consists of nine (9) tax parcels measuring approximately 19.23 acres and identified by Parcel Numbers 047-1-300-02-0 (10.16 acres), 047-1-291-00-0 (1.26 acres), 047-1-292-00-0 (1.2 acres), 047-1-301-00-0 (5.14 acres), 047-3-022-00-0 (0.42 acres), 047-3-021-00-0 (0.5 acres), 047-3-020-00-0 (0.38), 047-3-020-01-0 (0.06 acres), and 047-3-019-00-0 (0.11 acres).

A Site Location Map and a Topographic Map depicting the location of the Subject Property and its surrounding topography are included in Appendix A (Figures 1 and 2).

2.2 SUBJECT PROPERTY AND VICINITY GENERAL CHARACTERISTICS

The vicinity of the Subject Property is generally developed with commercial and public uses, and it is bordered by the following:

DIRECTION	LAND USE DESCRIPTION/OBSERVATIONS
NORTHEAST	Telfair Street
NORTHWEST	8 th Street
SOUTHEAST	7 th Street
SOUTHWEST	Fenwick Street

2.3 CURRENT USE OF THE PROPERTY

The Subject Property currently consists of the existing James Brown Arena, Bell Auditorium, associated parking and driveways, and grassed green spaces.

3.0 FIELD AND LABORATORY PROCEDURES

3.1 FIELD EXPLORATION

Boring locations were established in the field by NOVA personnel by utilizing a hand-held GPS unit and estimating distances and angles from existing site features. The approximate boring locations are shown on Figure 3 of Appendix A. Boring elevations were then interpolated from the provided site plan. Consequently, the referenced boring locations and elevations are approximate. If increased accuracy is desired by the client, NOVA recommends that the boring locations and elevations be surveyed.

Our field exploration was conducted between January 21, 2021 and January 27, 2021 and included:

- Nine (9) soil test borings (B-1 to B-4 and B-6 to B-10) drilled to depths of up to 60 feet below the existing ground surface within the footprint of the proposed arena and connector to Bell Auditorium.
- Three (3) soil test borings (B-16, B-17, and B-18) in the roadway on 7th Street and Walker Street drilled to depths of 15 feet below the existing ground surface.
- Nine (9) soil test borings (B-18 to B-21, and B-23 to B-28), drilled to depths of 10 feet below the existing ground surface.
- Up to six (6) additional borings will be performed in a second phase of this geotechnical investigation within the footprint of the proposed arena upon completion of demolition of the existing structures.

Soil Test Borings: The soil test borings were performed using the guidelines of ASTM Designation D-1586, "Penetration Test and Split-Barrel Sampling of Soils". A hollow-stem auger was used to advance the borings. At regular intervals, soil samples were obtained with a standard 1.4-inch I.D., 2.0-inch O.D., split-barrel sampler. The sampler was first seated six inches and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is designated the "Penetration Resistance". The penetration resistance, when properly interpreted, is an index to the soil strength and density. Representative portions of the soil samples, obtained from the sampler, were placed in glass jars and transported to our laboratory for further evaluation and laboratory testing.

Test Boring Records in Appendix B show the standard penetration test (SPT) resistances, or "N-values", and present the soil conditions encountered in the borings. These records represent our interpretation of the subsurface conditions based on the field exploration data, visual examination of the split-barrel samples, laboratory test data, and generally accepted geotechnical engineering practices. The stratification lines and depth

designations represent approximate boundaries between various subsurface strata. Actual transitions between materials may be gradual.

Undisturbed Samples: In addition to the split-spoon samples obtained from the borings, two (2) “undisturbed” Shelby tube samples of the soils were obtained from the site for consolidation and other laboratory testing.

Groundwater: The groundwater levels reported on the Test Boring Records represent measurements made at the completion of the soil test borings. The soil test borings were subsequently backfilled with the soil cuttings.

Infiltration Tests: For this preliminary Phase I field investigation and report, no infiltration testing was performed. In the second phase of this geotechnical investigation (after completion of demolition activities), infiltration tests will be performed using a double-ring infiltrometer in general accordance with applicable ASTM standards.

In-Situ Seismic Shear Wave Testing: Performance of a Site-Specific Seismic Evaluation was performed by NOVA during the course of this geotechnical investigation. The report of this evaluation will be issued under separate cover.

3.2 LABORATORY TESTING

Split-barrel samples were returned to our testing laboratory, where they were classified using visual/manual methods in accordance with the Unified Soil Classification System (USCS) and ASTM designations. The descriptions presented in the boring logs should be considered approximate.

Note that all soil samples will be properly disposed of 30 days following the submittal of this NOVA subsurface exploration report unless you request otherwise.

3.2.1 Soil Classification

Soil classification provides a general guide to the engineering properties of various soil types and enable the engineer to apply past experience to current problems. In our explorations, samples obtained during drilling operations are observed in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our "Test Boring Logs". The classification system discussed above is primarily qualitative; laboratory testing is generally performed for detailed soil classification. Using the test results, the soils were classified using the Unified Soil Classification Systems. This classification system and the in-place physical

soil properties provide an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

3.2.2 Moisture Content

The moisture content is the ratio expressed as a percentage of the weight of water in a given mass of soil to the weight of the solid particles. This test was conducted in general accordance with ASTM D 2216. A total of five (5) moisture content tests were performed in this study.

3.2.3 Sieve Analysis

The sieve analysis consists of passing a soil sample through a series of standard sieve openings. The percentage of soil, by weight, passing the individual sieves is then recorded and generally presented in a graphical format. The percentage of fines passing through the No. 200 sieve is generally considered to represent the amount of silt and clay of the tested soil sample. The sieve analysis test was conducted in general accordance with ASTM Designation D 1140. A total of five (5) sieve analysis tests were performed in this study.

3.2.4 Atterberg Limits

The Atterberg Limits are different descriptions of the moisture content of fine-grained soils as it transitions between a solid to a liquid-state. For classification purposes the two primary Atterberg Limits used are the plastic limit (PL) and the liquid limit (LL). The plastic index (PI) is also calculated for soil classification.

The plastic limit (PL) is the moisture content at which a soil transitions from being in a semisolid state to a plastic state. The liquid limit (LL) is defined as the moisture content at which a soil transitions from a plastic state to a liquid state. Five (5) tests were performed in this study in accordance with ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

3.2.5 Consolidation Test

To estimate the magnitude and the time rate of consolidation settlements, two (2) consolidation tests were performed using “undisturbed” clayey samples from borings B-3 and B-4. The tests were performed in general accordance with ASTM D2435 - Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading.

3.2.6 Proctor Test

Three (3) Standard Proctor compaction tests were performed in accordance with ASTM D 698 – Standard Test Methods for Laboratory Compaction of Soil Using Standard Effort to determine the relationship between the soils’ maximum dry unit weight and various moisture contents for use in controlling fill placement.

3.2.7 Triaxial Shear Strength Test

Two (2) Triaxial shear strength tests (with pore pressure measurements) were performed in accordance with ASTM D4767 – Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils to evaluate soil shear strength properties of in-situ soils and proposed fill materials.

3.2.8 CBR Test

Three (3) California Bearing Ratio (CBR) tests were performed in accordance with (ASTM D 1883 – Standard Test Method for CBR (California Bearing Ratio) to determine strength and deflection characteristics of soil correlated with pavement performance to establish design curves for pavement thickness.

3.2.9 Laboratory Data Summary

The following table displays the summarized results of the laboratory testing program. Detailed reports are found in Appendix C of this report.

Boring Number	Depth (ft)	Natural Moisture Content (%)	Percent Passing #200 Sieve (%)	Liquid Limit (LL)	Plastic Limit (PL)	Optimum Water Content (%)	Maximum Dry Density (pcf)	CBR (%)	USCS
B-3	13.5-15	25.0	41.7	-	-	-	-	-	SC
B-3	17-19	-	-	-	-	-	-	-	SC
B-4	8.5-10	20.7	-	31	16	-	-	-	SC
B-4	13-15	-	-	-	-	-	-	-	SC
B-6	13.5-15	26.6	49.9	-	-	-	-	-	SC
B-7	13.5-15	33.2	-	45	20	-	-	-	SC
B-9	23.5-25	29.3	63.5	47	25	-	-	-	CL
B-16	0-3	10.6	40.7	22	17	10.3	125.2	27.4	SC
B-17	0-3	11.2	29.8	-	-	10.4	122.0	31.2	SC
B-24	0-3	10.7	23.3	22	18	10.3	125.0	30.7	SC

4.0 SUBSURFACE CONDITIONS

4.1 GEOLOGY

The site is located in the Coastal Plain Geologic Region of Georgia. The Coastal Plain soils are composed of sedimentary deposits that extend from the fall line and thicken to the east as they approach the coast. The sedimentary deposits range in age from Upper Cretaceous to Recent. In the area of the project site, the surface soil profile often consists of sands with lenses of clay and silt of variable thickness. Sites located near the boundary with the Piedmont Geologic Region to the north are underlain by residual soils and rock formations of the Piedmont at various depths. The upper soils at the site appear to be more recent alluvial deposits associated with the floodplain areas of the Savannah River.

4.2 SOIL AND ROCK CONDITIONS

The following paragraphs provide generalized descriptions of the subsurface profiles and soil conditions encountered in the borings drilled during this study.

The Test Boring Records in Appendix B should be reviewed to provide more detailed descriptions of the subsurface conditions encountered at each boring location. These records represent our interpretation of the subsurface conditions based on the field logs and visual observations of samples by an engineer. The lines designating the interface between various strata on the Boring Logs represent the approximate interface locations and elevation. The actual transition between strata may be gradual. Groundwater levels shown on the Boring Logs represent the conditions at the time of drilling. It should be understood that soil conditions may vary between boring locations.

4.2.1 Surface Materials

Topsoil: Topsoil was encountered in borings B-1, B-8, and B-9 with a thickness of approximately two (2) to four (4) inches, respectively. Please note that topsoil thickness is frequently erratic and thicker zones of topsoil should be anticipated.

Pavement: Asphaltic concrete was encountered at borings B-3, B-4, B-6, B-10, and B-16 through B-28 with thicknesses ranging from 1.75 to 4.25 inches. This asphalt layer was typically followed by two (2) to three (3) inches of aggregate base. Portland cement concrete was encountered at boring B-2 with a thickness of approximately eight (8) inches, followed by six (6) inches of gravel base.

4.2.2 Fill Soils

Materials that appeared to be previously placed existing fill soils were encountered beneath the surface materials to depths ranging from approximately 3 to 5.5 feet below existing grades. Standard penetration resistance values (N-values) of these soils ranged from 3 to 34 bpf.

It is sometimes difficult to differentiate natural sands from clean fill soil by observing the split spoon samples retrieved from the drilling process. Consequently, some of the near-surface natural soils on the boring logs could possibly be fill.

4.2.3 Natural Coastal Plain/ Alluvial Soils

Natural Coastal Plain and more recent alluvial soils were encountered beneath the surficial materials and fill. The natural Coastal Plain/ alluvial soils generally consisted of very loose to medium dense SAND and clayey SAND, and very soft to stiff sandy CLAY.

Standard penetration resistance values (N-values) ranged from 1 to 33 bpf, but more typically ranged from about 3 to 15 bpf. It appears that the lower consistency upper materials are recent alluvial soils associated with the floodplain of the Savannah River while the deeper soils are more ancient Coastal Plain sediments.

4.2.4 Piedmont Residual Soils

Residual soils associated with the Piedmont geophysical region were encountered in borings B-1 through B-10 beneath the near surface fill and/or natural Coastal Plain/ alluvial soils at depths ranging from 26 to 32 feet below existing grades. The residuum generally consisted of firm to very hard medium to fine sandy SILT. Standard penetration resistance values (N-values) ranged from 8 to 78 bpf, but more typically ranged from about 8 to 50 bpf.

4.2.5 Partially Weathered Rock

Partially weathered rock (PWR) is a transitional material between soil and the underlying parent rock that is defined locally as materials that exhibit a standard penetration resistance exceeding 100 bpf.

PWR was encountered in eight (8) borings (B-2 through B-10), at depths ranging from 27 to 57 feet below the ground surface (approximate elevations of 73 to 93 Ft-MSL). PWR is typically observed immediately above auger refusal levels. The following table depicts the locations, depths, and approximate elevations where

PWR was encountered during this study. The depths in the table represent the top of PWR encountered.

BORING	DEPTH (feet)	APPROXIMATE ELEVATION (feet-MSL)
B-2	27	93
B-3	43	87
B-4*	52	78
B-6	47	84
B-7	57	73
B-8	42.5	92.5
B-9	52	82
B-10	43.5	85.5

* This indicates the PWR layer is a lens underlain by residual soils.

4.2.6 Auger Refusal Materials

Auger refusal materials are any very hard or very dense material, frequently boulders or the upper surface of bedrock, which cannot be penetrated by a power auger. Auger refusal was encountered in four (4) borings at depths ranging from 30 to 50 feet below the ground surface (approximate elevations of 79 to 100 Ft-MSL). The following table depicts the locations, depths, and approximate elevations where auger refusal was encountered during this study.

Rock coring to determine the nature and continuity of refusal materials was beyond the scope of this exploration.

BORING	DEPTH (feet)	APPROXIMATE ELEVATION (feet-MSL)
B-1	35	96
B-2	30	90
B-3	45	85
B-10	50	79

4.3 GROUNDWATER CONDITIONS

4.3.1 General

Groundwater in the Coastal Plain region typically occurs as an upper unconfined system., underlain by one or more confined systems. Recharge is provided by the infiltration of rainfall and surface water through pervious overburden soils. Where

near-surface sands are underlain by low-permeability soil, the infiltrating rainwater or runoff can become trapped above the low-permeability soils, creating a temporary perched water condition. Groundwater levels vary with changes in season and rainfall, construction activity, surface water runoff, and other site-specific factors.

4.3.2 Soil Test Boring Groundwater Conditions

Groundwater was encountered in all of the borings (except for B-28) at depths ranging from 1 to 12.5 feet below existing grades (approximate elevations of 118.5 to 124.5 Ft-MSL). Groundwater levels were measured at the time of drilling and after 24 hours or more where feasible. Please note that stabilized groundwater elevations may be different than those observed during the drilling operations. The following table depicts the locations, depths, and approximate elevations where groundwater was encountered during this study.

BORING	DEPTH (feet)	APPROXIMATE ELEVATION (feet-MSL)
B-1	11	120
B-2	1	119
B-3	10	120
B-4	10	120
B-6	10	121
B-7	10.5	119.5
B-8	11	124
B-9	10.5	123.5
B-10	8.5	120.5
B-16	12.5	118.5
B-17	8.5	124.5
B-18	7.5	121.5
B-19	7	123
B-20	7	122
B-21	5.5	124.5
B-23	5	123
B-24	9.5	123.5
B-25	7	123
B-26	8.5	121.5
B-27	8.5	121.5

5.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on our understanding of the proposed construction, our site observations, our evaluation and interpretation of the field and laboratory data obtained during this exploration, our experience with similar subsurface conditions, and generally accepted geotechnical engineering principles and practices.

Subsurface conditions in unexplored locations or at other times may vary from those encountered at specific boring locations. If such variations are noted during construction, or if project development plans are changed, we request the opportunity to review the changes and amend our recommendations, if necessary.

As previously noted, boring locations were established by estimating distances and angles from site landmarks. If increased accuracy is desired by the client, we recommend that the boring locations and elevations be surveyed.

5.1 SITE PREPARATION

5.1.1 Demolition

The existing James Brown Arena with its associated slabs, pavements, and other infrastructure currently occupy much of the proposed new James Brown Arena footprint. We understand that the existing arena has a basement level with an underdrain and permanent dewatering system and a top of slab elevation of approximately 122.5 ft-MSL. The existing arena will be razed to allow for the construction of the new arena. The existing slabs, walls and columns should be removed as part of the demolition. We recommend that the underdrain system beneath the basement slab remain in place and in service to aid in providing a stable work platform for construction operations.

The existing column foundations beneath the basement level could potentially be abandoned in place depending upon the final layout of the foundations for the new area. Any existing foundations located directly beneath proposed new foundations will need to be removed to allow for installation of the recommended RAP system discussed in Section 5.5. The selected RAP contractor should be allowed the opportunity to review the location of the existing foundations compared to the new foundations to confirm the foundations that can be abandoned in place.

Prior to proceeding with construction, all demolished structures, slabs, foundations, pavements, and any other surface or subsurface obstructions should be removed and disposed of in accordance with appropriate solid waste rules and regulations.

5.1.2 General

Any vegetation, root systems, topsoil, and other deleterious non-soil materials should be stripped from proposed construction areas. Clean topsoil may be stockpiled and subsequently re-used in landscaped areas. Debris-laden materials should be excavated, transported, and disposed of off-site in accordance with appropriate solid waste rules and regulations. All existing utility locations should be reviewed to assess their impact on the proposed construction and relocated/grouted in-place as appropriate.

After clearing and stripping, areas which are at grade or will receive fill should be carefully evaluated by a NOVA geotechnical engineer. The engineer will require proofrolling of the subgrade with multiple passes of a 20 to 30 ton loaded truck, or other vehicle of similar size and weight.

The purpose of the proofrolling is to locate soft, weak, or excessively wet fill or residual soils present at the time of construction. Unstable materials observed during the evaluation and proof-rolling operations should be undercut and replaced with structural fill or stabilized in-place by scarifying and re-densifying.

In the event that low density, soft and/or debris laden fill materials are encountered during construction, typical recommendations would include undercutting and backfilling with structural fill and/or stabilizing in-place with fabric, stone, and/or other remedial techniques. Actual remedial recommendations can best be determined by the geotechnical engineer in the field at the time of construction.

The site should be graded during construction such that positive drainage is maintained away from the construction areas, to prevent ponding of storm water on the site during and shortly following significant rain events. The construction areas should also be sealed and crowned with a smooth roller to minimize ponding water from storm events at the end of each day of work. The fine-grained soils encountered during our exploration are weather sensitive and will be susceptible to loss of strength and density if exposed to freeze/thaw and or wetting/drying cycles. Care must be exercised by the grading contractor to protect subgrades and new fills from inclement weather.

5.1.3 Existing / Old Fill

Previously placed fill materials were encountered during this exploration. These fill soils were generally clean and free of organic or otherwise deleterious materials. Based on our experience, we anticipate fill materials likely exist at other locations between our borings. In the event that low density, soft and/or debris-laden fill materials are encountered during construction, typical recommendations would include undercutting and backfilling with structural fill and/or stabilizing in-place with fabric, stone, and/or other remedial techniques. Actual remedial recommendations can best be determined by the geotechnical engineer in the field at the time of construction.

5.1.4 Difficult Excavation

None of the borings encountered dense soil, PWR or rock above anticipated finished or excavation grades. However, as previously discussed, the weathering process at this site is erratic and variations in the partially weathered rock or rock profile can occur in small lateral distances. Therefore, it is possible that dense soil, PWR and/or rock may be encountered in areas between the boring locations.

5.2 FILL PLACEMENT

5.2.1 Fill Suitability

Fill materials should be low plasticity soil (Plasticity Index less than 30), free of non-soil materials and rock fragments larger than 3 inches in any one dimension. Based on visual examination of the soil materials encountered during this exploration, the existing natural soils and much of the existing onsite fill does not contain appreciable amounts of debris, rock organics or other deleterious materials and generally appears suitable for re-use as structural fill. Prior to construction, bulk samples of the proposed fill materials should be laboratory-tested to confirm their suitability.

Organic and/or debris-laden material is not suitable for re-use as structural fill. Topsoil, mulch, and similar organic materials can be wasted in architectural areas. Debris-laden materials should be excavated, transported, and disposed of off-site in accordance with appropriate solid waste rules and regulations.

All materials to be used for backfill or compacted structural fill construction should be evaluated, and if necessary, tested by NOVA prior to placement to determine if they are suitable for the intended use. Any off-site materials used as fill should be approved by NOVA prior to acquisition.

5.2.2 Soil Compaction

Fill should be placed in thin, horizontal loose lifts (maximum 8-inch) and compacted to at least 95 percent of the standard Proctor maximum dry density (ASTM D 698). In confined areas, such as utility trenches or behind retaining walls, portable compaction equipment and thinner fill lifts (3 to 4 inches) may be necessary. Fill materials used in structural areas should have a target maximum dry density of at least 95 pounds per cubic foot (pcf). If lighter weight fill materials are used, the NOVA geotechnical engineer should be consulted to assess the impact on design recommendations.

Soil moisture content should be maintained within 3 percent of the optimum moisture content. We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting fill soils. Moisture control may be difficult during rainy weather. If soils are excavated near or below the groundwater table, they will require significant effort to bring them to acceptable moisture contents prior to re-use as fill.

Filling operations should be observed by a NOVA soils technician, who can confirm suitability of material used and uniformity and appropriateness of compaction efforts. He/she can also document compliance with the specifications by performing field density tests using nuclear or sand cone testing methods (ASTM, D 6938, or D 1556, respectively). One test per 400 cubic yards and every 2 feet of placed fill is recommended, with test locations well distributed throughout the fill mass. When filling in small areas, at least one test per day per area should be performed.

5.2.3 Settlement:

The existing basement footprint will require fills up to 20 feet deep to establish proposed finished grades. These deep fills will induce significant settlements in the underlying natural soils, as well as self-consolidation of the fill due to its own weight. Typically, a majority of the settlement will occur during construction of the new fill mass; however, continued movement should be anticipated after completion of the new fill. We recommend that construction over the basement backfill area be delayed a minimum of 30 to 60 days until the fill induced settlement has stabilized. A minimum five (5) settlement monuments should be established at the surface of the new fill immediately upon the completion of grading. Survey readings should be taken a minimum of twice a week and provided to NOVA for review in order to help determine when construction should proceed in this area.

5.3 GROUNDWATER CONTROL

5.3.1 General

During the current study, depths to groundwater ranged from 1 to 12.5 feet below the existing ground surface (approximate elevations ranging from 118.5 to 124.5 feet-MSL). Depending on the area of the site under consideration, groundwater levels have differing implications for design and construction. The extent and nature of any dewatering required during construction will be dependent on the actual groundwater conditions prevalent at the time of construction and the effectiveness of construction drainage to prevent run-off into open excavations.

Temporary dewatering will likely be required during demolition and backfilling of the existing basement. As previously discussed, we recommend care be exercised during demolition to allow the existing underdrain and dewatering system to remain in place and function as much as possible to reduce the amount of temporary dewatering required during construction.

As previously noted, groundwater levels are subject to seasonal, climatic and other variations and may be different at other times and locations. The extent and nature of any dewatering required during construction will be dependent on the actual groundwater conditions prevalent at the time of construction and the effectiveness of construction drainage to prevent run-off into open excavations.

5.3.2 Temporary Dewatering

Design of a temporary dewatering system is usually the responsibility of the contractor. However, based on our experience with similar conditions, and in consideration of the excavation depths below the groundwater table (<5 feet), we believe a conventional construction dewatering system of trenches, sumps, and pumps should be possible to control both groundwater and rainfall runoff.

At the time of construction, groundwater must be lowered and continuously maintained at a minimum depth of 3 feet below the working elevation to permit subgrade preparation and foundation excavation and construction

5.4 SLOPES

All new fill placed should be properly benched into the existing slopes and should be compacted in accordance with the requirements outlined in Section 5.2. It is good practice to over-build slopes and then back cut the slopes to the proper grade.

Slope stability analysis using laboratory shear strength data was beyond the scope of this study. However, based on our experience with similar subsurface conditions and construction, permanent slopes no steeper than 2.0(H): 1.0(V) should be stable long term, if limited in height to 10 feet, are not inundated or subjected to groundwater seepage.

Adjacent to buildings, a top of slope set-back of 10 feet is recommended. In pavement areas, a minimum top of slope setback of 5 feet is acceptable.

Temporary slopes should be no steeper than OSHA guidelines. During construction, temporary slopes should be regularly inspected for signs of movement or unsafe condition. Soil slopes should be covered for protection from rain, and surface run-off should be diverted away from the slopes. For erosion protection, a protective cover of grass or other vegetation should be established on permanent soil slopes as soon as possible.

5.5 FOUNDATION RECOMMENDATIONS

5.5.1 General

Structural loading information was provided as of the time of this exploration and report. Typical interior column loads include dead loads of 425 kips and live loads of 275 kips. Typical column supporting long-span roof loads include dead loads of 625 kips and live loads of 325 kips. We assume soil-supported ground floor loads (live loads) in the new buildings will not exceed 125 pounds per square foot (psf).

Based on the above loads, settlements were estimated using correlations between SPT values and typical elastic modulus values, and the subsurface conditions encountered during our exploration. Due to the presence of deep zones of compressible fill and Coastal Plain/ alluvial soils across the building, we estimate that the use of conventional shallow foundations on unimproved subgrade could potentially result in total settlements of approximately 2 to 3 inches or more at individual foundations supported on the unimproved existing fill.

5.5.2 Rammed Aggregate Piers - Arena Foundations

We recommend the proposed Arena be supported by shallow foundations bearing on an improved subgrade that has been remediated by the installation of a rammed aggregate pier (RAP) system. Please note that RAP systems are typically designed for approximately 1 inch of settlement. Two types of RAP systems are commonly used in the area: Vibro (Aggregate) Piers and Geopiers®. Both systems typically result in design bearing pressures of 5 to 7 ksf (usually 6 ksf).

Both Vibro (Aggregate) Piers and Geopiers® are proprietary design/build systems. A load test in accordance with ASTM specifications should be performed by the specialty contractor (under the observation of a NOVA engineer) on one RAP element (stone column) to confirm the load carrying capacity.

RAP systems can be designed to resist relatively light uplift loads, typical of low to mid rise parking decks. However, if the building design results in significant tension loads, the use of uplift anchors, or an augered cast-in-place foundation system will be required.

Although RAPs are a proprietary design-build foundation system, NOVA requests the opportunity to review the design parameters, including the anticipated RAP embedment depths, once the specialty subcontractor is selected.

Vibro (Aggregate) Piers: The Vibro (Aggregate) Pier system is a ground improvement technique performed by the Hayward Baker company that constructs stone columns in the subsurface soils. The stone columns provide a stiff, non-liquefiable inclusion in the loose fill zones, improves the subgrade support capacity for foundation loads, and provide drainage elements for the rapid drainage of excess pore water pressures that result from seismic events.

The pier location is initially pre-drilled for soils where the hole will remain open. In soils that cave or collapse, a bottom feed vibrator can be used. The down-hole vibrator is lowered vertically to the planned tip of the pier by a standard crane or rig built for this technique. Aggregate (new crushed stone or recycled concrete) is then added to the hole or through the bottom-feed system and is compacted in lifts by repeated penetrations with the vibrator. The vibratory energy densifies the aggregate and any surrounding granular soil. The high modulus pier reinforces the treatment zone.

Geopier®: Geopiers® are similar to Vibro (Aggregate) Piers as the final constructed product consists of stone columns. Consequently, we anticipate similar performance between Vibro (Aggregate) Piers and Geopiers® in improving foundation support.

The Geopier® System creates a cavity in the soil by either pre-drilling to a predetermined level (using a steel casing in soft soils and high groundwater conditions), or by pushing/driving a mandrel to the designated level. Stone placed in the casing or through the mandrel is then driven vertically with an angled tamper foot to compact the stone, as well as to force the stone laterally into the cavity sidewalls.

The mandrel method displaces the soil into the sidewalls of the hole; therefore, minimal soil spoil is generated. Neither the drilled method nor the mandrel method injects water into the subsurface as part of the installation process; consequently, we do not anticipate Geopier® construction will have a significant impact to the groundwater levels.

5.5.3 Micropile Foundations - Connector to Bell Auditorium

The existing Bell Auditorium includes a basement level adjacent to new at grade foundations for the connector from the new arena. Consequently, these connector foundations must be designed and constructed to prevent adding surcharge loads to the basement wall of the Bell Auditorium. We recommend the use of micropiles to support these foundations.

Micropiles are a deep foundation system that consists of small diameter drilled and grouted friction piles. To obtain high-capacity micropiles, a down-hole percussion hammer would be used to penetrate through the soils to embed the micropiles into the underlying bedrock. A high-strength steel casing is then placed in the drill hole, extending full-depth to the bottom of the hole. A threaded center reinforcing steel bar may also be used for micropiles subject to uplift loads. The micropile is pressure grouted beyond the end of the casing and upward into the annulus between the casing and the rock to create a frictional bond between the micropile and the surrounding rock. Based on the installation procedures, micropiles can be utilized in both environmentally impacted soil and groundwater conditions as well as non-environmentally impacted conditions.

Compression: Micropile capacity is a function of the drill hole diameter and the length of embedment into the underlying bedrock. Based on the and the subsurface conditions encountered during our previous explorations, we recommend using a 150-ton design consisting of 7⁵/₈-inch diameter micropiles or a 200-ton design consisting of 9⁵/₈-inch diameter micropiles embedded a minimum of 15 feet into competent bedrock. If desired, a 250-ton design consisting of 9⁵/₈-inch diameter micropiles embedded approximately 20 feet into competent bedrock can also be utilized for design.

Actual micropile load capacity, as well as confirmation of installation methods, should be determined by load tests. A minimum of two (2) test piles should be loaded to twice the design load in accordance with ASTM D 1143-81, Testing of Piles under Axial Compressive Load. The test piles should not be production piles. A system of structural beams (reaction frame) should be set and attached to the anchors. A leveling plate should be attached to the surface of the test pile and a calibrated hydraulic jack set in position with the load centered on the pile.

Test pile deflection should be monitored with a minimum of three (3) dial gauges spaced equally around the top of the leveling plate. All test pile monitoring equipment should be supplied by the contractor.

Tension: Uplift capacity of a micropile is typically one-half ($\frac{1}{2}$) of the pile's compressive capacity. Actual uplift capacity can be determined by either installing strain gauges (such as Geokon Model 4911 "Sister Bar") on the center reinforcing bar during the compression load test, or by performing an uplift (pullout) test on the piles.

Lateral: Resistance to lateral shear loads is difficult to obtain due to the annular space around the micropile that remains during standard installation. To provide shear resistance, the piles are typically pressure grouted downward through the steel casing to the bottom of the pile, with grout return upward outside the casing to fill the annular space between the soil and the top of the pile.

Lateral loads can be resisted by the stiffness of the micropiles, by "fixing" the tops of the micropiles in a cap or with grade beams to other caps, battering the micropiles, or constructing a keyway around the micropiles. As micropiles are a proprietary design, the micropile contractor can choose the most appropriate method of resisting lateral loads. All production micropiles should be placed with the same procedures used for installation of the test micropiles.

Spacing: A minimum pile spacing of 3 feet, center-to-center, is recommended.

Design / Build: The actual micropile design is typically provided as a proprietary design/build system by a specialty contractor. Consequently, we recommend that the specialty contractor be allowed some flexibility in determining micropile diameter, casing diameter, reinforcing bar diameter, etc. to reflect the specialty contractor's specific equipment, means, and methods.

Our experience indicates the integrity of micropiles is highly dependent on appropriate installation methods and techniques. Consequently, the specialty contractor performing the work should have installed micropiles for a minimum of

five (5) years and should submit a list containing at least five (5) micropile projects.

5.5.4 Shallow Foundations – Lightly Loaded Structures

Design: Lightly loaded structures (<100 kips) such as awnings, lightly loaded walls, etc. may be supported by conventional shallow foundations.

To reduce potential differential movements between spread foundations and micropile supported portions of the structure, we recommend lightly loaded spread foundations bearing on undisturbed natural soils and/or compacted structural fill may be designed for a maximum allowable bearing pressure of 2,000 pounds per square foot (psf).

Previously placed fill materials were encountered on the site. If low consistency or debris-laden fill materials are present in foundation excavations, undercutting and backfilling with crushed stone or structural fill will be required. The actual remedial requirements will be determined by the geotechnical engineer at the time of construction.

We recommend minimum foundation widths of 24 inches for ease of construction and to reduce the possibility of localized shear failures. Exterior foundation bottoms should be at least 18 inches below exterior grades for protection against frost damage.

Settlement: Settlements for lightly loaded (<100 kips) spread foundations bearing on the higher consistency residual materials were assessed using SPT values to estimate elastic modulus, based on published correlations and previous NOVA experience. We note that the settlements presented are based on random field data and an assumed subsoil profile. Conditions may be better or worse in other areas, however, we believe the estimated settlements are reasonably conservative.

Based on column loadings (<100 kips), soil bearing capacities and the presumed foundation elevations as discussed above, we expect primary total settlement beneath individual foundations to be up to ½-inch.

The amount of differential settlement is difficult to predict because the subsurface and foundation loading conditions can vary considerably across the site. However, we anticipate differential settlement between adjacent spread foundation and micropile foundation supported structures will be the same as the total settlement (½-inch). The final deflected shape of the structure will be dependent on actual foundation locations and loading.

Construction: Foundation excavations should be evaluated by the NOVA geotechnical engineer prior to reinforcing steel placement to observe foundation subgrade preparation and confirm bearing pressure capacity.

Foundation excavations should be level and free of debris, ponded water, mud, and loose, frozen, or water-softened soils. Concrete should be placed as soon as is practical after the foundation is excavated and the subgrade evaluated. Foundation concrete should not be placed on frozen or saturated soil. If a foundation excavation remains open overnight, or if rain or snow is imminent, a 3 to 4-inch thick "mud mat" of lean concrete should be placed in the bottom of the excavation to protect the bearing soils until reinforcing steel and concrete can be placed.

5.6 SLAB-ON-GRADE

5.6.1 General

The conditions exposed at subgrade levels will vary across the site and may include structural fill or natural soils. Slabs-on-grade may be adequately supported on these subgrade conditions subject to the recommendations in this report. Slabs-on-grade should be jointed around columns and along walls to reduce cracking due to differential movement. A 4-inch layer of crushed stone may be placed beneath the building slabs to reduce non-uniform support conditions.

Once grading is completed, the subgrade is usually exposed to adverse construction activities and weather conditions during the period of sub-slab utility installation. The subgrade should be well-drained to prevent the accumulation of water. If the exposed subgrade becomes saturated or frozen, the geotechnical engineer should be consulted to provide recommendations.

After utilities have been installed and backfilled, a final subgrade evaluation should be performed by the geotechnical engineer immediately prior to slab-on-grade placement. If practical, proofrolling may be used to re-densify the surface and to detect any pumping subgrade soils that have become excessively wet or otherwise loosened.

5.6.2 Subgrade Modulus

A coefficient of subgrade reaction (k) of 125 pci (psi per inch) may be used for conventional slab design where slabs bear upon subgrades prepared in accordance with previous recommendations.

Please note that this magnitude of k is intended to reflect the elastic response of soil beneath a typical floor slab under light loads with a small load contact area often measured in square inches, such as loads from forklifts, automobile/truck traffic or lightly loaded storage racks. The recommended coefficient of subgrade reaction (k) of 125 pci is not applicable for heavy slab loads caused by bulk storage or tall storage racks, or for mat foundation design.

Several design methods are applicable for conventional slab design. We have assumed that the slab designer will utilize the methods discussed in the American Concrete Institute (ACI) Committee 360 report, *“Guide to Design of Slabs-on-Ground, (ACI 360R-10)”*, specifically the Portland Cement Association (PCA), or the Wire Reinforcement Institute (WRI) slab thickness design methods.

5.7 BELOW GRADE WALLS

The magnitude and distribution of earth pressures against below grade walls depends on the deformation condition (rotation) of the wall, soil properties and water conditions. When the soil behind the wall is prevented from lateral strain, the resulting force is known as the at-rest earth pressure (K_0). If the retaining structure moves away from the soil mass, the earth pressure decreases with the increasing lateral expansion until a minimum pressure, known as the active earth pressure (K_A), is reached. If the wall is forced into the soil mass, the earth pressure increases until a maximum pressure, known as the passive earth pressure (K_P), is obtained.

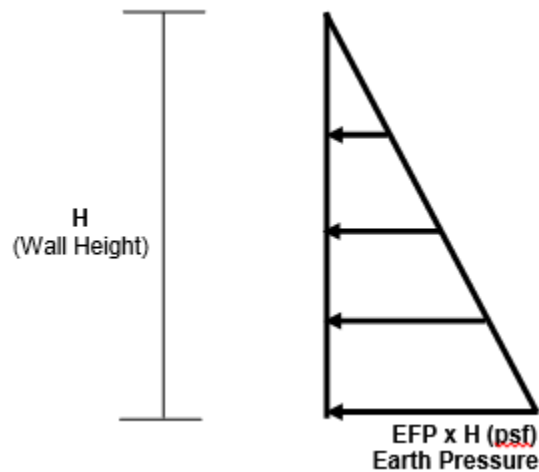
Free-standing retaining walls are usually designed for active earth pressures. Rigid basement walls are typically designed for at-rest earth pressures. If basement walls will be backfilled before they are braced by the floor slabs, they should also be designed to withstand active earth pressures as self-supporting cantilever walls. However, the earth pressures must be compatible with the wall rotation, which is limited by the wall rigidity, foundation support conditions and connections to adjoining structures. If active earth pressure development requires horizontal wall movements that cannot occur, or which are architecturally undesirable, walls should be designed for an intermediate pressure based on restraint conditions.

Laboratory analysis to determine actual soil shear strength properties was beyond the authorized scope of services. Based on our experience with similar soils and construction, we are providing the earth pressure estimates shown in the following table.

Earth Pressure Condition	Earth Pressure Coefficient	Equivalent Fluid Pressure (pcf)	
		Above Water Table	Below Water Table
Soil Backfill			
Active (K_a)	0.33	40	80
At-Rest (K_o)	0.50	60	89
Passive (K_p)	3.00	150*	TBD**
#57 Stone Backfill			
Active (K_a)	0.29	35	75
At-Rest (K_o)	0.46	55	84
Passive (K_p)	3.40	400*	TBD**

* Passive earth pressure is frequently used in retaining wall design to resist active earth pressures. Wall movements required to develop full passive earth pressures are significantly greater than movements necessary for active earth pressures. Consequently, this passive pressure value has been reduced by at least 50% for wall design

** Passive earth pressure for submerged wall design shall be determined on a case-by-case basis.



We recommend a value of 0.35 as the coefficient of friction (sliding resistance) between wall foundations and the underlying residual or fill soils. A coefficient of friction of 0.45 is recommended for foundations bearing on PWR. A coefficient of friction of 0.5 is recommended for foundations bearing on rock. These design values do not contain a safety factor.

Our lateral earth pressure recommendations assume that:

- The ground surface adjacent to the wall is level,
- Residual soils will be reused for wall backfill, compacted between 95% to 98% of the standard Proctor maximum dry density,
- Soil backfill unit weight is a maximum of 120 pcf,

- Heavy construction equipment does not operate within 5 feet of the walls,
- A constantly functioning drainage system is installed between the wall and the soil backfill to prevent hydrostatic pressures from acting on the wall,
- Foundations or other significant surcharge loads are located outside the wall a distance at least equal to the wall height,
- For active earth pressure, wall must rotate about base, with top lateral movements of about 0.002 H to 0.004 H, where H is wall height,
- For passive earth pressure to develop, wall must move horizontally to mobilize resistance.

5.8 PAVEMENT SECTIONS

5.8.1 Flexible Pavement

Site-specific traffic loading data was not available for this exploration. However, based on subsurface conditions encountered at this site, the recommended site preparation, and an average laboratory CBR of 25, our typical recommended flexible pavement design for similar facilities is shown in the following table:

Pavement Section	Standard Duty *	Heavy Duty **
Asphaltic Surface Course (9.5 mm SuperPave, GDOT approved mix)	2 inches	2 inches
Asphaltic Base Course (19 mm SuperPave, GDOT approved mix)	N/A	2 inches
Graded Aggregate Base (GAB) or Recycled Concrete Base Course (from an approved GDOT source)	6 inches	8 inches
Stabilized Subgrade (compacted to a minimum 98% of the standard Proctor maximum dry density)	12 inches	12 inches

* Standard Duty – Driveways and parking lots restricted to automobile traffic

** Heavy Duty – Driveways and parking lots subject to automobile and truck traffic

We recommend a minimum compaction of 98 percent of the maximum dry density for the Graded Aggregate Base (GAB as determined by the modified Proctor compaction test (ASTM D 1557, Method C). The crushed stone should conform to applicable sections of the current GDOT Standard Specifications. All asphalt material and paving operations should meet applicable specifications of the

Asphalt Institute and GDOT. A NOVA technician should observe placement and perform density testing of the base course material and asphalt.

5.8.2 Rigid Pavement

A rigid pavement section is recommended in areas where heavy truck traffic, excessive braking, sharp wheel turning and/or point loads, like dumpsters and loading docks are planned. Based on the subsurface conditions at the site, the recommended site preparation, assumed low volume traffic loads and an estimated subgrade modulus (k) of 125 psi/inch for traffic or wheel loading, our recommended rigid pavement design is as follows:

Pavement Section	Standard Duty *	Heavy Duty **
GDOT approved air-entrained concrete mix	5 inches	7 inches
Graded Aggregate Base (GAB) or Concrete Base Course (from an approved GDOT source)	4 inches	4 inches
Control Joint Spacing (maximum)	10 feet X 10 feet	12 feet X 12 feet
Saw-Cut Depth (minimum)	1½ inches	2 inches

* Standard Duty – Driveways and parking lots restricted to automobile traffic

** Heavy Duty – Driveways and parking lots subject to automobile and truck traffic

All concrete materials and placement should conform to applicable GDOT specifications. We recommend that a non-woven geotextile (about 3 feet wide) be placed beneath the construction joints to prevent upward "pumping" movement of soil fines through the joints.

We recommend using concrete with a minimum compressive strength of 4,000 psi and a minimum 28-day flexural strength (modulus of rupture) of at least 600 psi, based on 3-point loading of concrete beam test samples. Layout of the saw-cut control joints should form square panels, and the depth of saw-cut joint should be approximately ¼ of the concrete slab thickness. The joints should be sawed within six (6) hours of concrete placement or as soon as the concrete has developed sufficient strength to support workers and equipment.

We recommend that NOVA review and comment on the final concrete pavement design, including section and joint details (type of joints, joint spacing, etc.), prior

to the start of construction. For further details on concrete pavement construction, please reference the “Building Quality Concrete Parking Areas”, published by the Portland Cement Association.

Please note that the recommended pavement section is based on an assumed post-construction traffic loading. If the pavement is to be constructed and utilized by heavy construction truck traffic, the above pavement section will likely prove insufficient for heavy truck traffic, such as delivery trucks, concrete trucks or tractor-trailers used for construction materials delivery. Unexpected distress, reduced pavement life and /or pre-mature failure of the pavement section could result if subjected to heavy construction traffic. The owner should be aware of this risk. If the assumed traffic loading stated herein is not correct, NOVA should review actual pavement loading conditions to determine if revisions to these recommendations are warranted.

5.9 SEISMIC SOIL SITE CLASS

A seismic survey using two seismic traverses was performed to provide profiles to depths of 100 feet for seismic shear. Shear-wave velocity profiles were obtained to determine the seismic Soil Site Class. The results of the seismic shear wave survey are presented in NOVA’s Report of Site-Specific Seismic Evaluation submitted under separate cover.

Based upon the average velocities obtained in the upper 100 feet of the shear velocity profiles, we believe the soil profiles associated with a Site Class “C” are generally appropriate for the site.

5.10 SUPPLEMENTAL GEOTECHNICAL STUDY

After demolition and site preparation has advanced to an appropriate stage, NOVA will perform six (6) additional borings within the footprint of the proposed new arena construction, in addition to performing double-ring infiltrometer testing at the site. This final geotechnical exploration will be performed to provide additional information with regard to site preparation, excavation, groundwater conditions, and foundation design recommendations. At this stage, we believe it would be prudent to assess the geotechnical data to determine whether modifications to the recommendations are necessary. We also recommend a future design meeting between NOVA and other design team members to address geotechnical concerns at specific locations.

6.0 CONSTRUCTION OBSERVATIONS

6.1 SUBGRADE

Once site grading is completed, the subgrade may be exposed to adverse construction activities and weather conditions. The subgrade should be well-drained to prevent the accumulation of water. If the exposed subgrade becomes saturated or frozen, the NOVA geotechnical engineer should be consulted.

A final subgrade evaluation should be performed by the NOVA geotechnical engineer immediately prior to pavements. If practical, proof-rolling may be used to re-densify the surface and to detect any pumping soil, which has become excessively wet or otherwise loosened.

6.2 SHALLOW FOUNDATIONS

Foundation excavations should be level and free of debris, ponded water, mud, and loose, frozen or water-softened soils. All foundation excavations should be evaluated by the NOVA geotechnical engineer prior to reinforcing steel placement to observe foundation subgrade preparation and confirm bearing pressure capacity. Due to variable site subsurface and construction conditions, some adjustments in isolated foundation bearing pressures, depth of foundations or undercutting and replacement with controlled structural fill may be necessary.

6.3 RAP FOUNDATIONS

Installation of all rammed aggregate pier foundation (RAP) elements should be observed and documented by a NOVA engineer. Subsequent foundation excavations should be level and free of debris, ponded water, mud, and loose, frozen or water-softened soils.

APPENDIX A

Figures and Maps

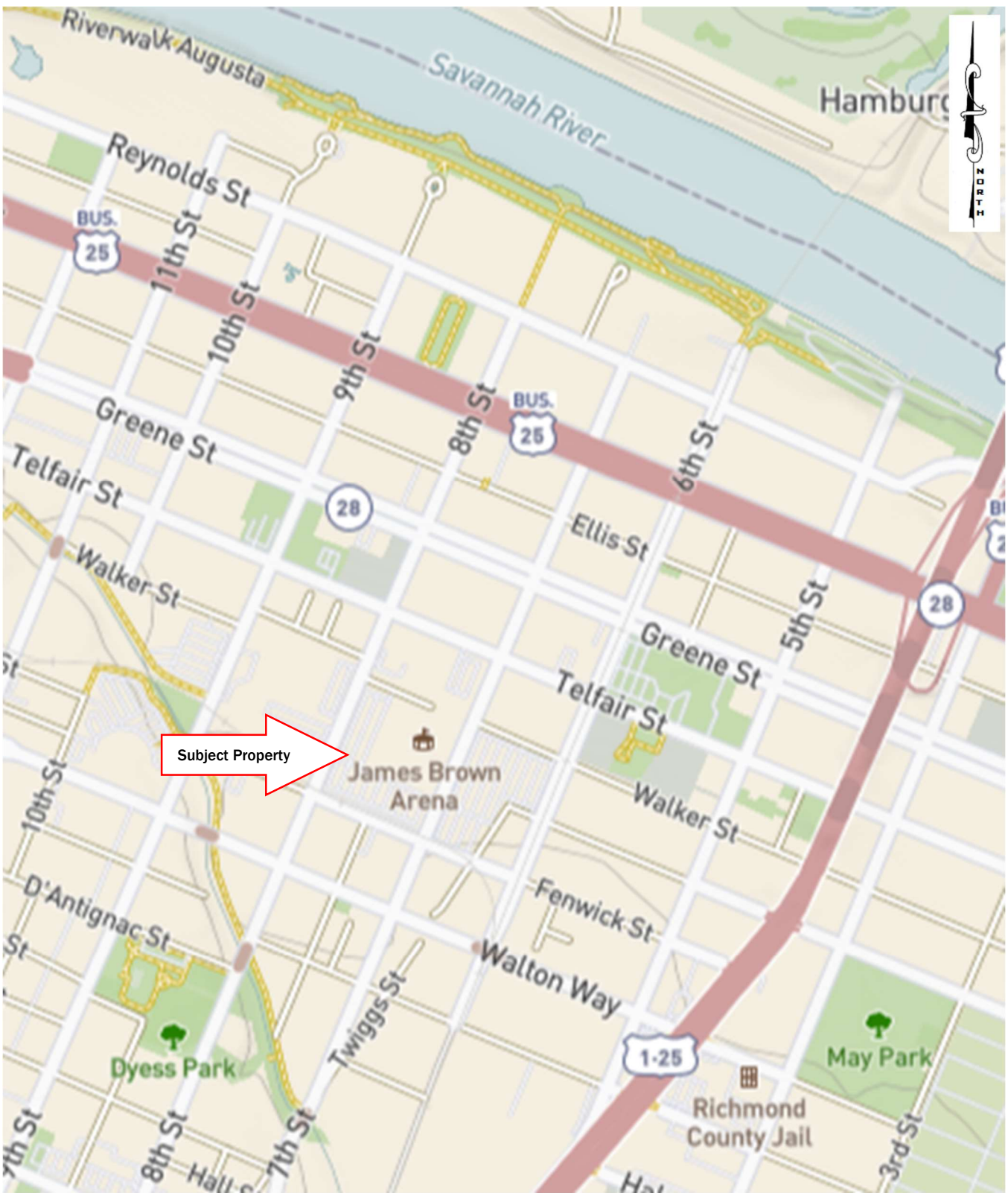


FIGURE 1
SITE LOCATION MAP

SOURCE: USGS Topoview
DATE: Accessed 2/18/2021
SCALE: Not To Scale



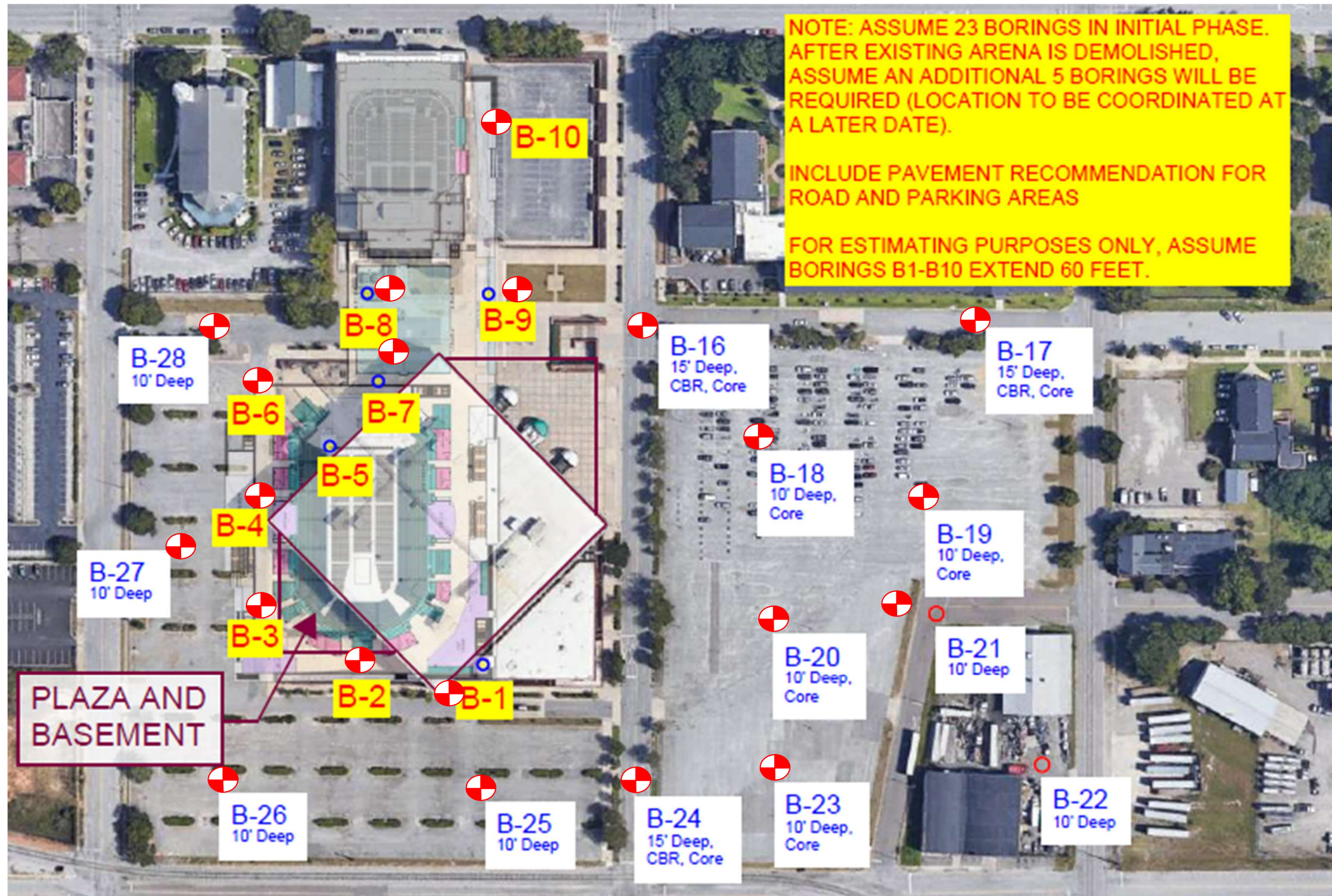
JAMES BROWN ARENA
H.J. Russel & Company
Augusta, Georgia
NOVA Project Number 10103-2021003



FIGURE 2
TOPOGRAPHIC MAP
SOURCE: USGS Topoview
USGS Augusta East, GA Quadrangle
2020, Augusta, Georgia
SCALE: Not To Scale



JAMES BROWN ARENA
H.J. Russel & Company
Augusta, Georgia
NOVA Project Number 10103-2021003

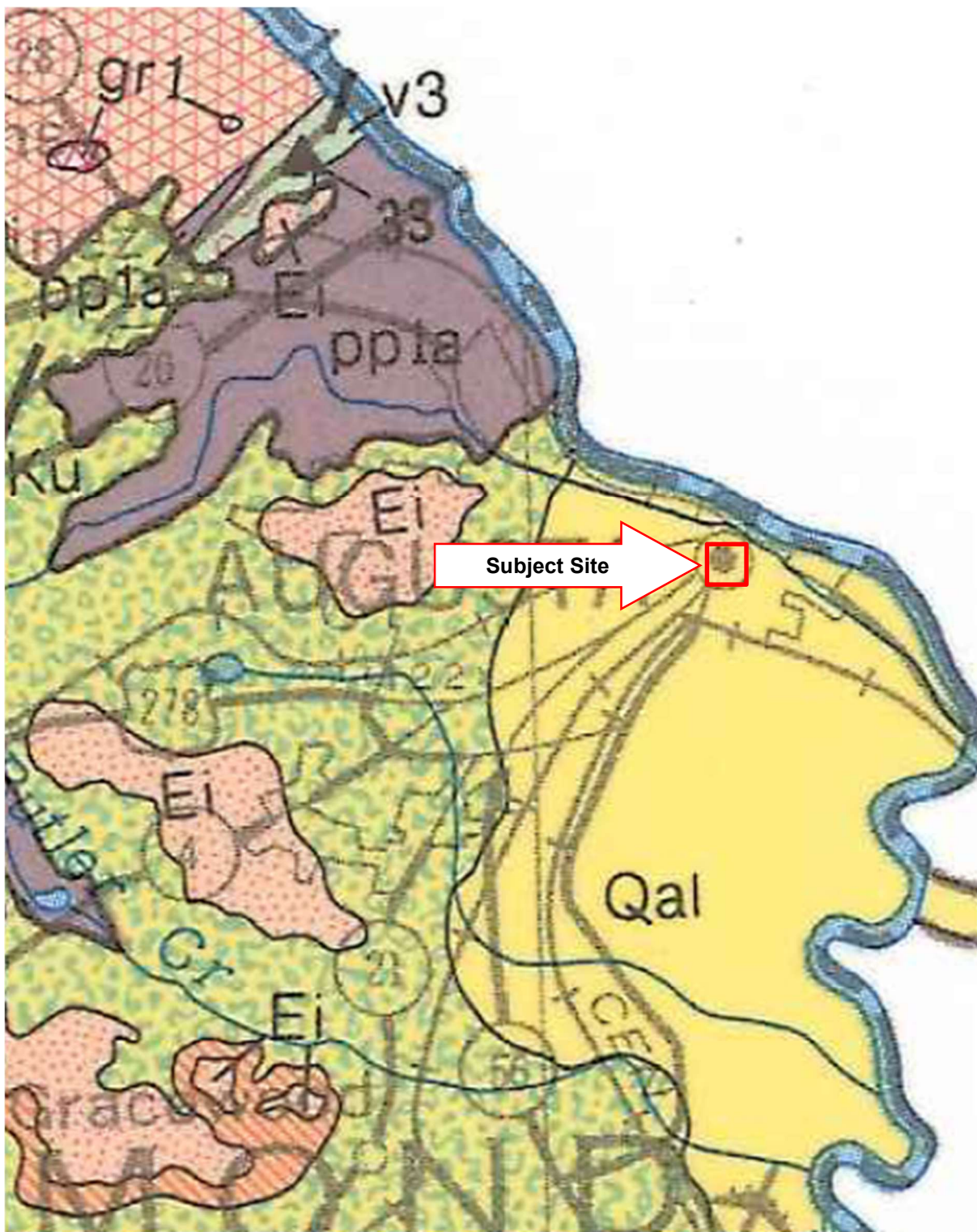


⊕ APPROXIMATE LOCATION OF NOVA BORINGS

FIGURE 3
BORING LOCATION PLAN
 Source: Overall Site Plan- Perkins and Will
 Scale: Not to Scale



JAMES BROWN ARENA
 H.J. Russel & Company
 Augusta, Georgia
 NOVA Project Number 10103-2021003



Coastal Plain Holocene Stream Alluvium and Undifferentiated Terrace Deposits

FIGURE 4
REGIONAL GEOLOGY
SOURCE: Geologic Map of Georgia, 1976. Lawton, et al.



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NOVA Project Number 10103-2021003

APPENDIX B

Subsurface Data

KEY TO SYMBOLS AND CLASSIFICATIONS

DRILLING SYMBOLS

	Split Spoon Sample
	Undisturbed Sample (UD)
	Standard Penetration Resistance (ASTM D1586-67)
	Water Table at least 24 Hours after Drilling
	Water Table 1 Hour or less after Drilling
100/2"	Number of Blows (100) to Drive the Spoon a Number of Inches (2)
NX, NQ	Core Barrel Sizes: 2½- and 2-Inch Diameter Rock Core, Respectively
REC	Percentage of Rock Core Recovered
RQD	Rock Quality Designation – Percentage of Recovered Core Segments 4 or more Inches Long
	Loss of Drilling Water
MC	Moisture Content Test Performed

CORRELATION OF PENETRATION RESISTANCE WITH RELATIVE DENSITY AND CONSISTENCY

	<u>Number of Blows, "N"</u>	<u>Approximate Relative Density</u>
SANDS	0 – 4	Very Loose
	5 – 10	Loose
	11 – 30	Medium Dense
	31 – 50	Dense
	Over 50	Very Dense
	<u>Number of Blows, "N"</u>	<u>Approximate Consistency</u>
SILTS and CLAYS	0 – 2	Very Soft
	3 – 4	Soft
	5 – 8	Firm
	9 – 15	Stiff
	16 – 30	Very Stiff
	31 – 50	Hard
	Over 50	Very Hard

DRILLING PROCEDURES

Soil sampling and standard penetration testing performed in accordance with ASTM D1586-67. The standard penetration resistance is the number of blows of a 140 pound hammer falling 30 inches to drive a 2-inch O.D., 1½-inch I.D. split spoon sampler one foot. Core drilling performed in accordance with ASTM D2113-08. The undisturbed sampling procedure is described by ASTM D1587-08 (2012). Soil and rock samples will be discarded 60 days after the date of the final report unless otherwise directed.

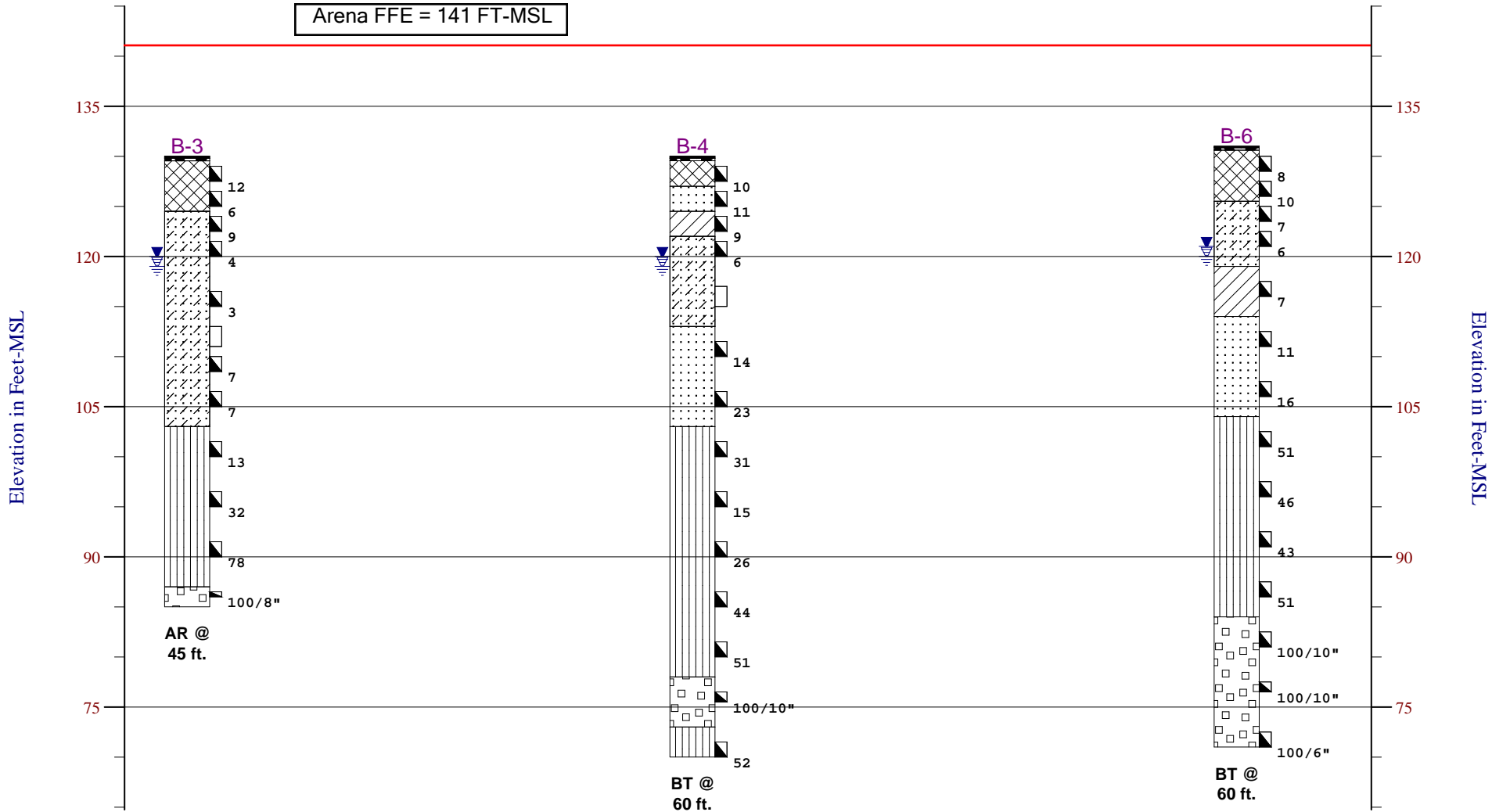
SOIL CLASSIFICATION CHART

COARSE GRAINED SOILS	GRAVELS	Clean Gravel less than 5% fines	GW	Well graded gravel
			GP	Poorly graded gravel
		Gravels with Fines more than 12% fines	GM	Silty gravel
			GC	Clayey gravel
	SANDS	Clean Sand less than 5% fines	SW	Well graded sand
			SP	Poorly graded sand
Sands with Fines more than 12% fines		SM	Silty sand	
		SC	Clayey sand	
FINE GRAINED SOILS	SILTS AND CLAYS Liquid Limit less than 50	Inorganic	CL	Lean clay
			ML	Silt
		Organic	OL	Organic clay and silt
			SILTS AND CLAYS Liquid Limit 50 or more	Inorganic
	MH	Elastic silt		
	Organic	OH		Organic clay and silt
HIGHLY ORGANIC SOILS				PT

PARTICLE SIZE IDENTIFICATION

GRAVELS	Coarse	¾ inch to 3 inches
	Fine	No. 4 to ¾ inch
SANDS	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40
SILTS AND CLAYS		Passing No. 200

Arena FFE = 141 FT-MSL



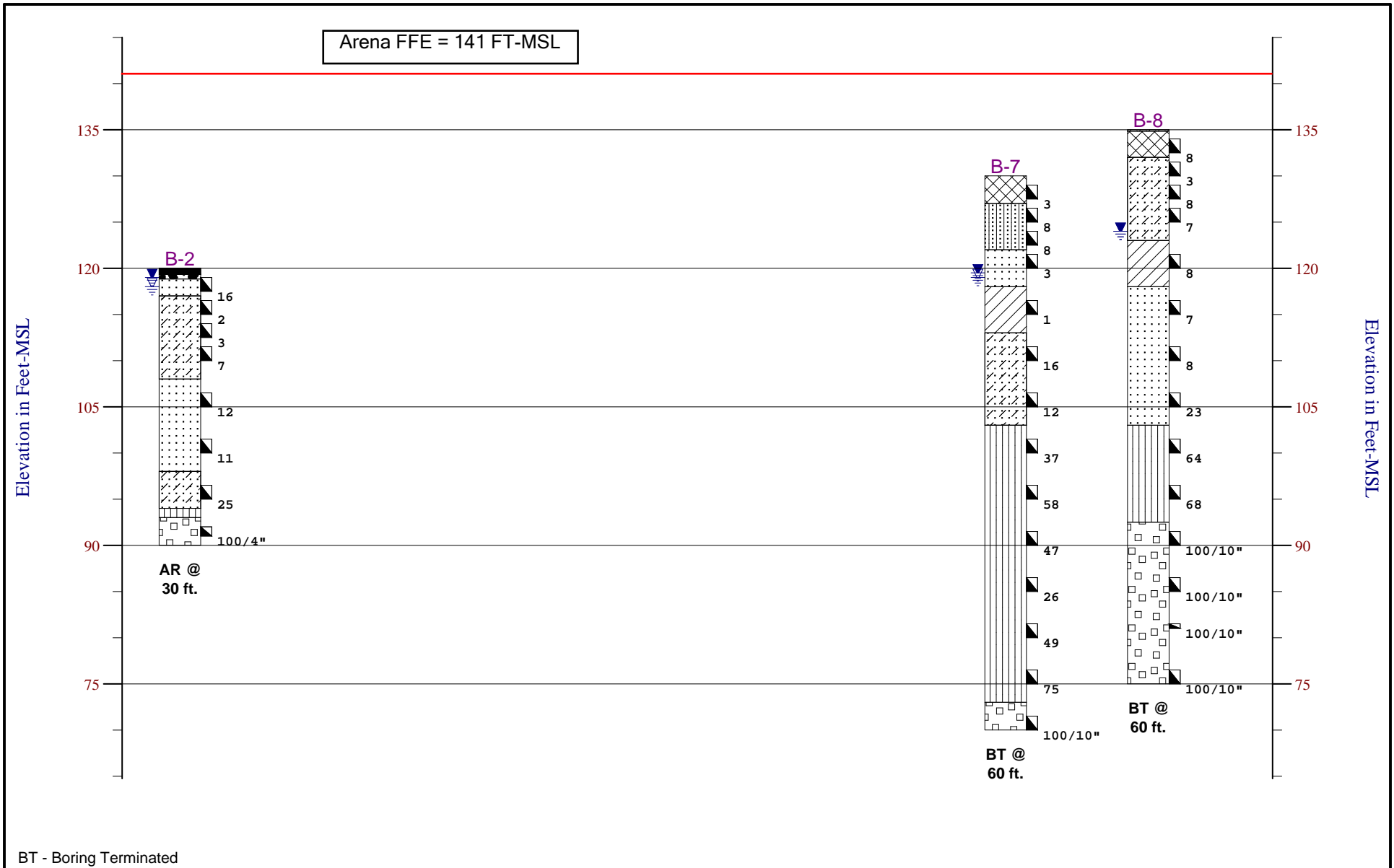
BT - Boring Terminated

- Paving
- Gravel
- Fill
- Description not given for: "SR"
- Silt
- Partially Weathered Rock
- Sand
- Low plasticity clay
- Water table during drilling



General Subsurface Profile A-A'

James Brown Arena
 H.J. Russell & Company
 Augusta, Richmond County, Georgia
 NOVA Project Number 2021003



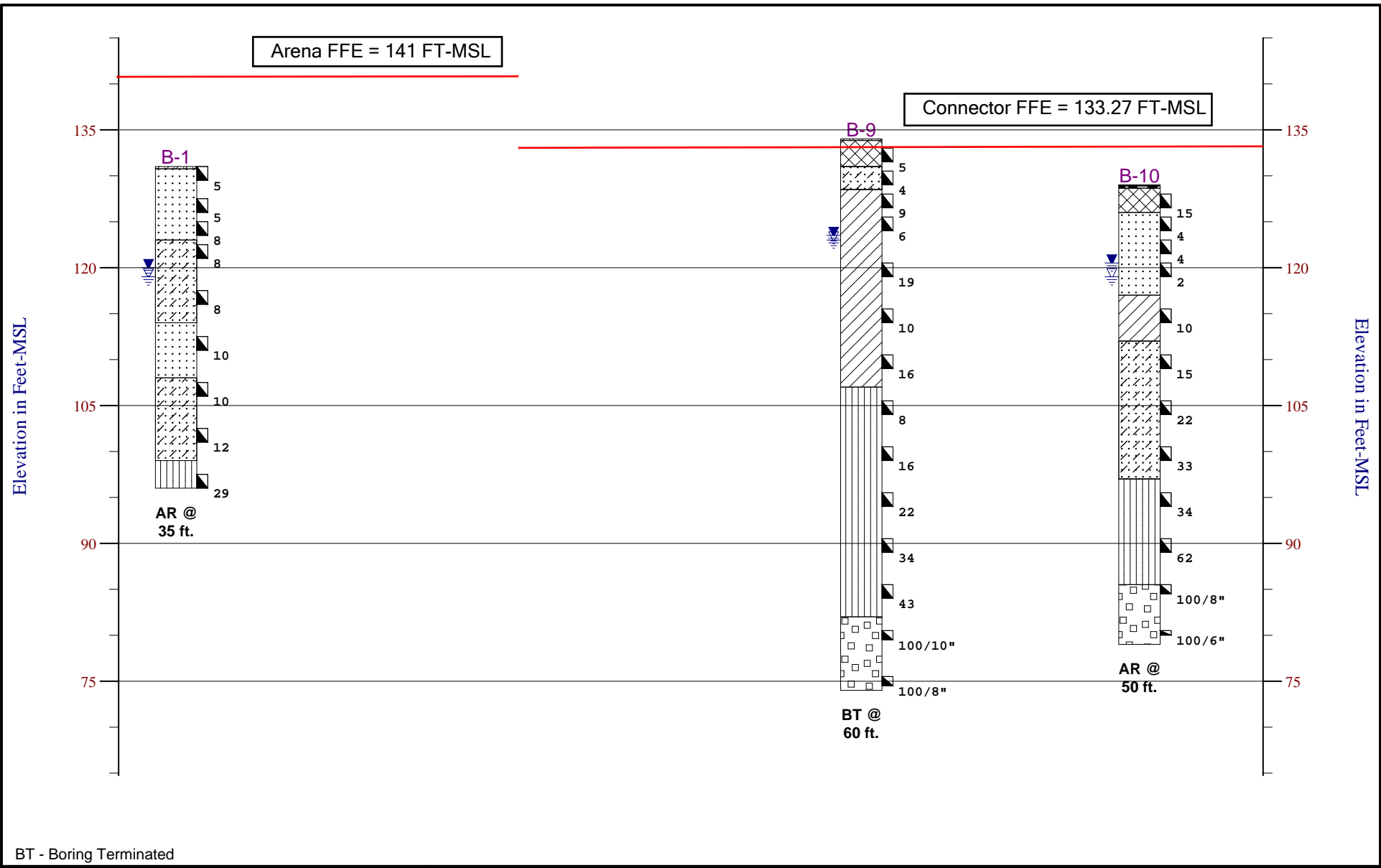
BT - Boring Terminated

- | | |
|----------------------------------|----------------------------|
| ■ Paving | □ Partially Weathered Rock |
| ▨ Gravel | ▨ Fill |
| ▤ Sand | ▤ Silty sand |
| ▧ Description not given for "SR" | ▧ Low plasticity clay |
| ▩ Silt | ▩ Topsoil |



General Subsurface Profile B-B'

James Brown Arena
 H.J. Russell & Company
 Augusta, Richmond County, Georgia
 NOVA Project Number 2021003



BT - Boring Terminated

	Topsoil		Low plasticity clay
	Sand		Partially Weathered Rock
	Description not given for "SR"		Paving
	Silt		Gravel
	Fill		



General Subsurface Profile C-C'

James Brown Arena

H.J. Russell & Company

Augusta, Richmond County, Georgia

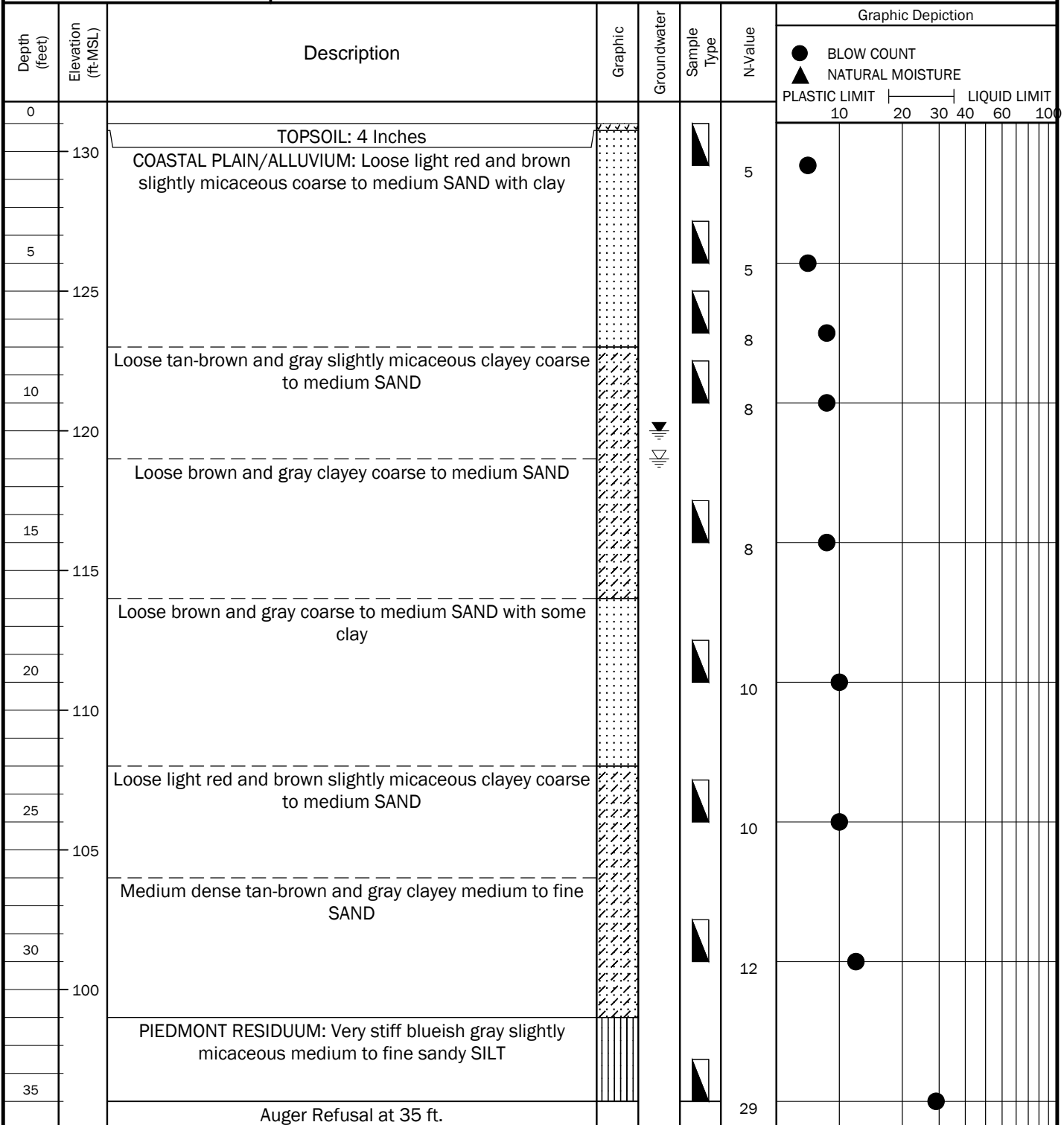
NOVA Project Number 2021003



TEST BORING RECORD B-1

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 131 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-27-2021
 DEPTH TO - WATER> INITIAL: 12 AFTER 24 HOURS: 11 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

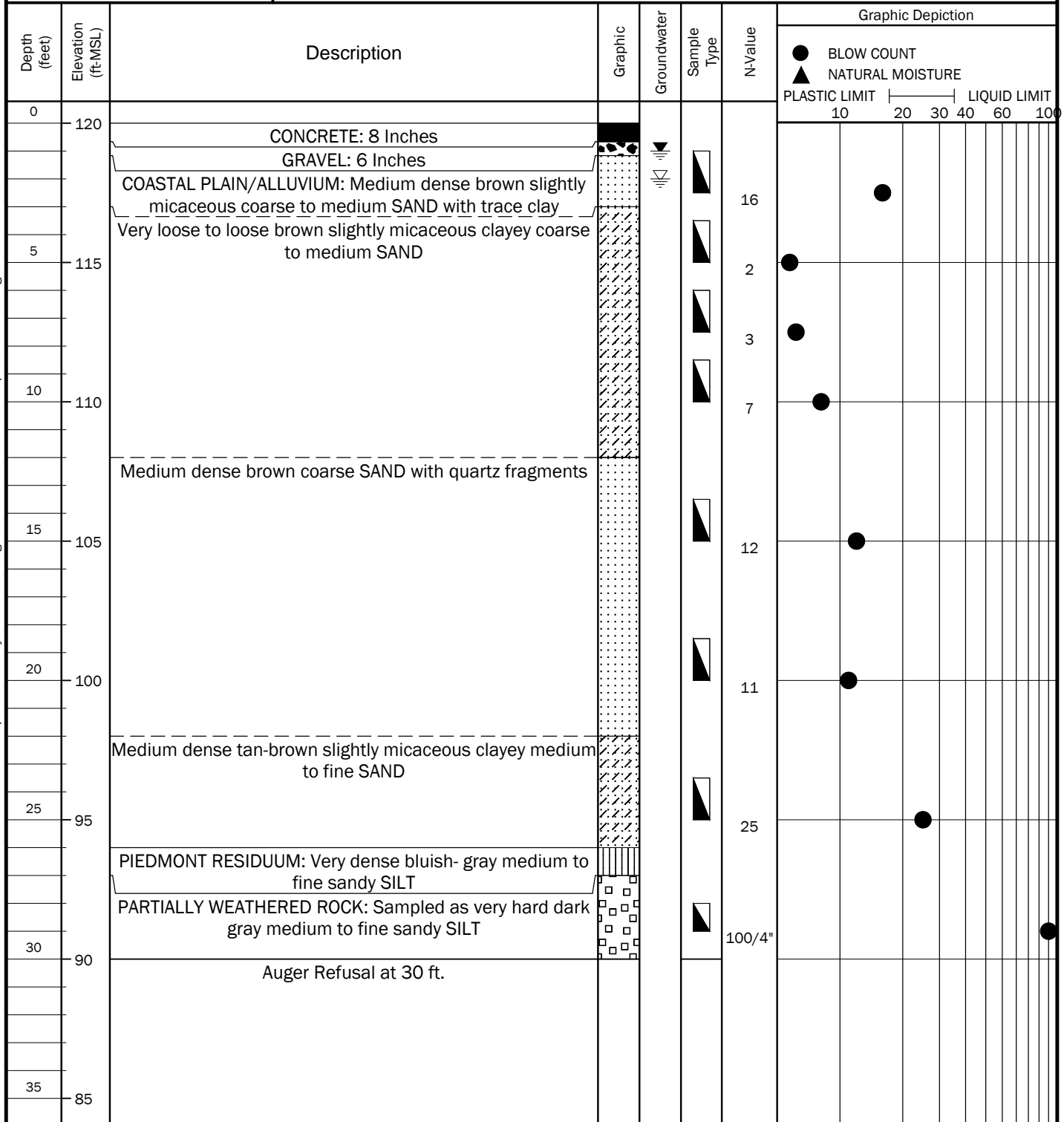




TEST BORING RECORD B-2

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 120 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-26-2021
 DEPTH TO - WATER> INITIAL: 2 AFTER 24 HOURS: 1 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

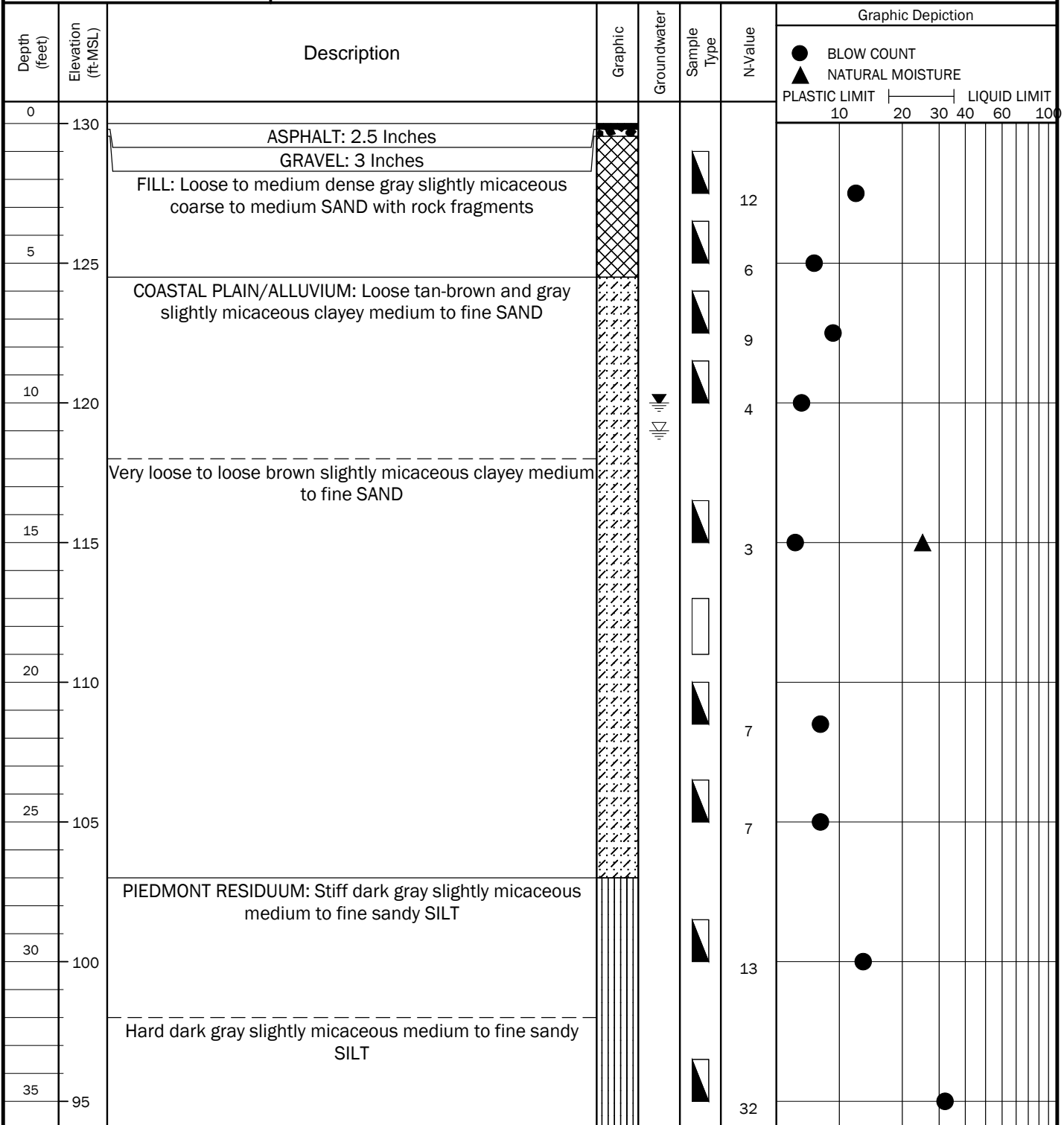




TEST BORING RECORD B-3

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 130 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-26-2021
 DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: 10 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.





**TEST BORING
RECORD
B-3**

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 130 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-26-2021
 DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: 10 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

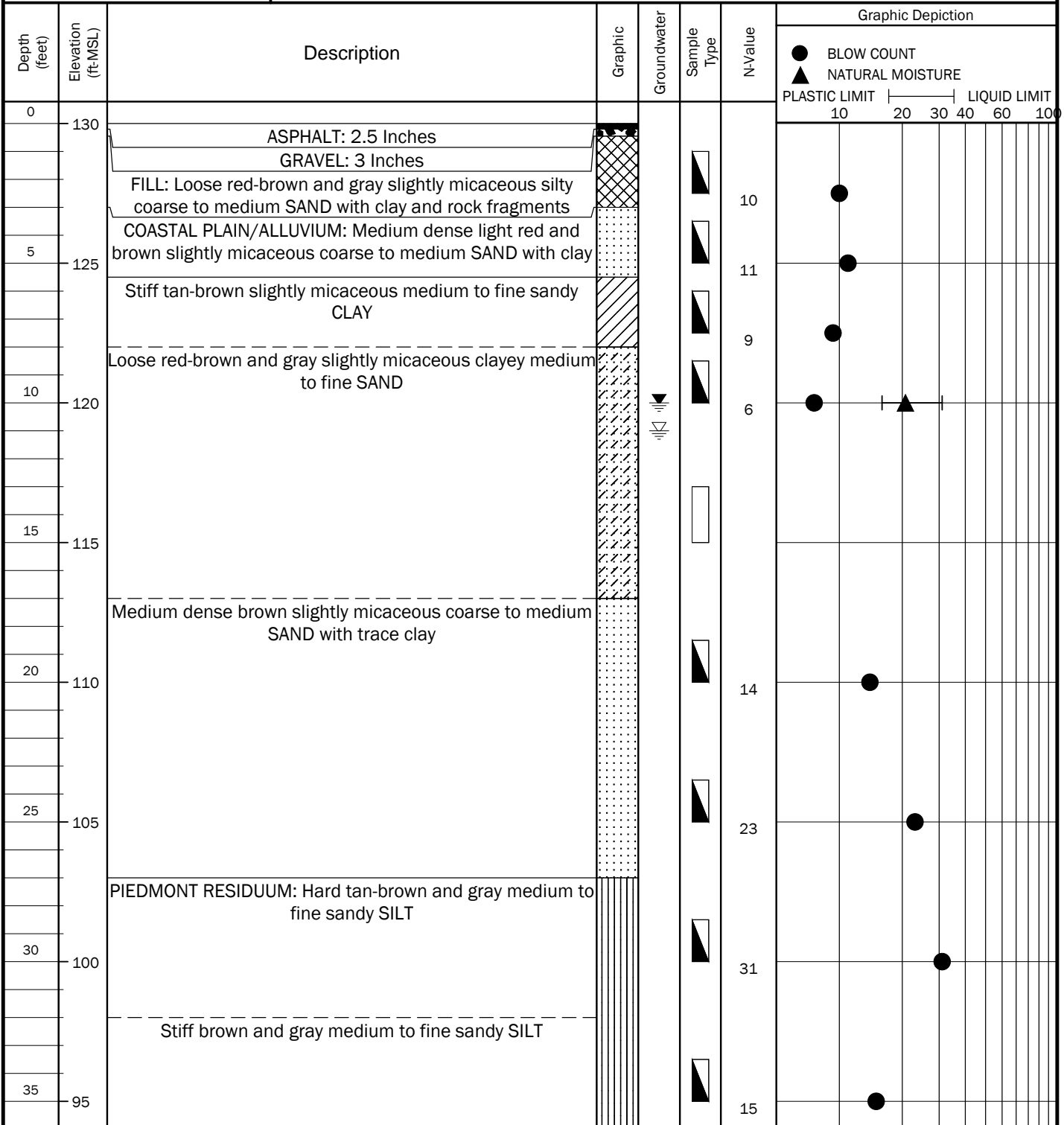
Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value	Graphic Depiction	
							● BLOW COUNT	▲ NATURAL MOISTURE
							PLASTIC LIMIT	LIQUID LIMIT
							10 20 30 40 60 100	10 20 30 40 60 100
40	90	Very hard dark gray slightly micaceous medium to fine sandy SILT				78		
45	85	PARTIALLY WEATHERED ROCK: Sampled as very hard dark gray slightly micaceous medium to fine sandy SILT				100/8"		
		Auger Refusal at 45 ft.						
50	80							
55	75							
60	70							
65	65							
70	60							



TEST BORING RECORD B-4

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 130 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-26-2021
 DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: 10 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

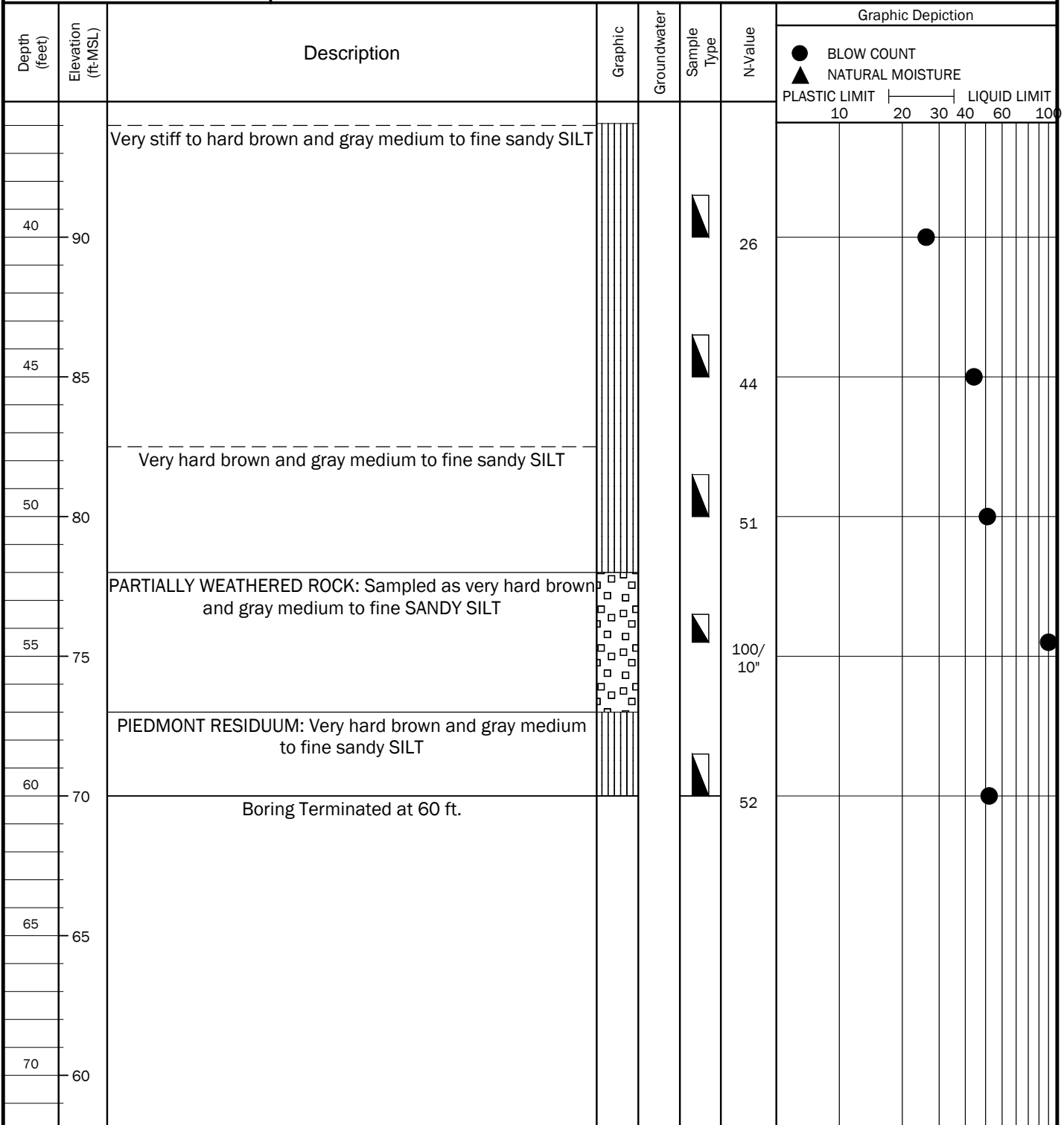




TEST BORING RECORD B-4

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 130 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-26-2021
 DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: 10 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

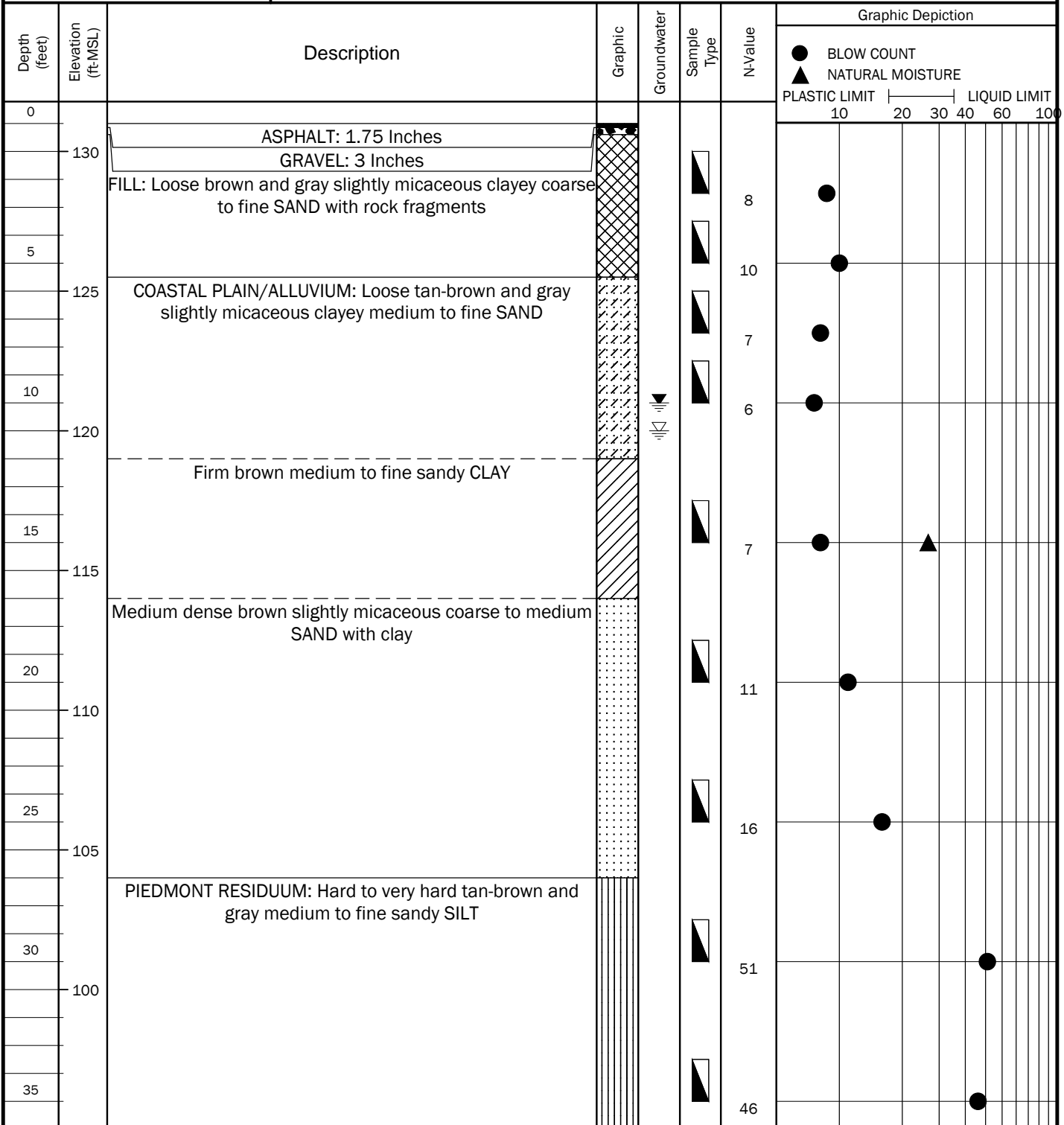




TEST BORING RECORD B-6

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 131 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-25-2021
 DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: 10 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

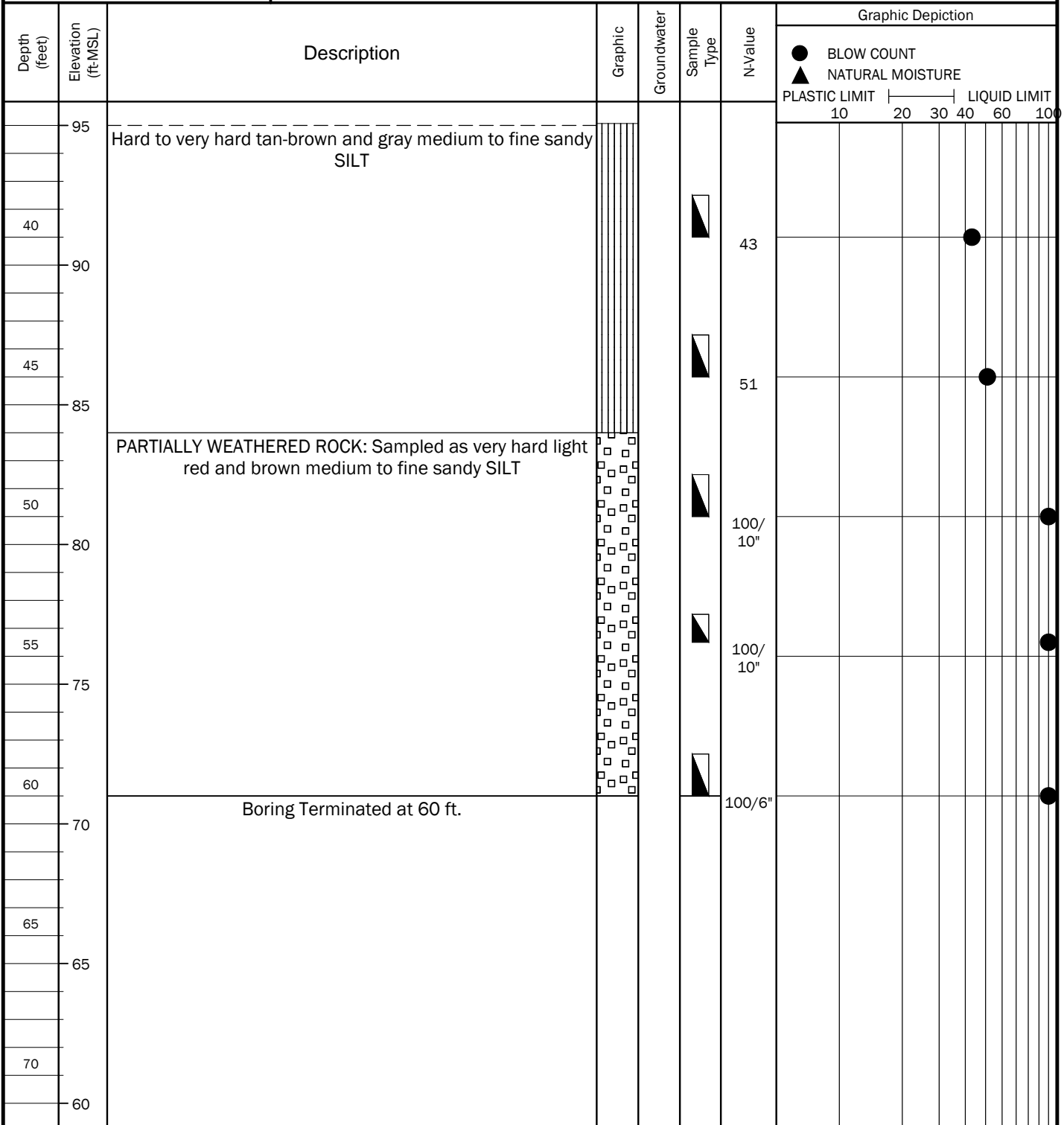




TEST BORING RECORD B-6

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 131 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-25-2021
 DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: 10 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

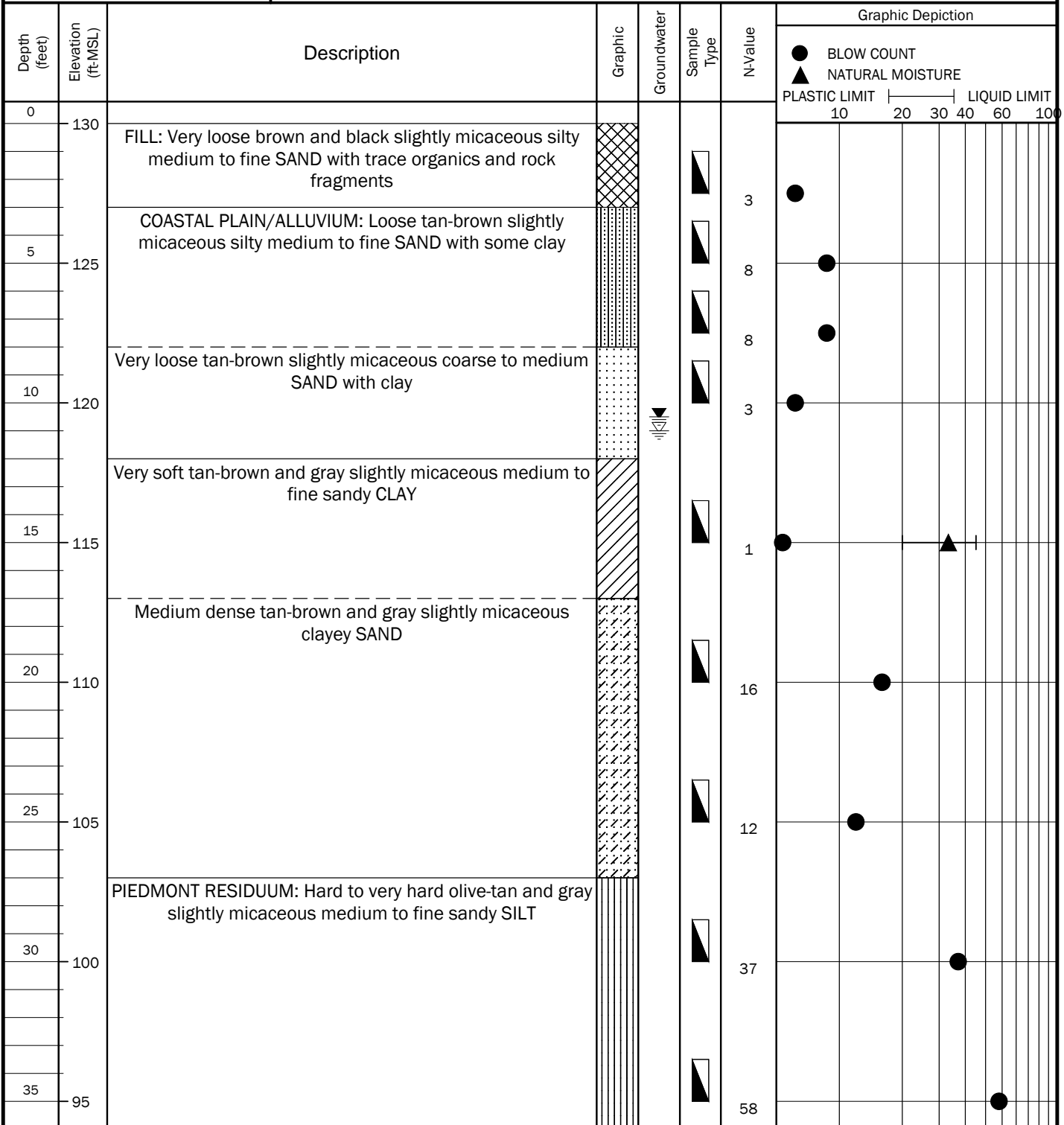




TEST BORING RECORD B-7

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 130 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-25-2021
 DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: 10.5 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

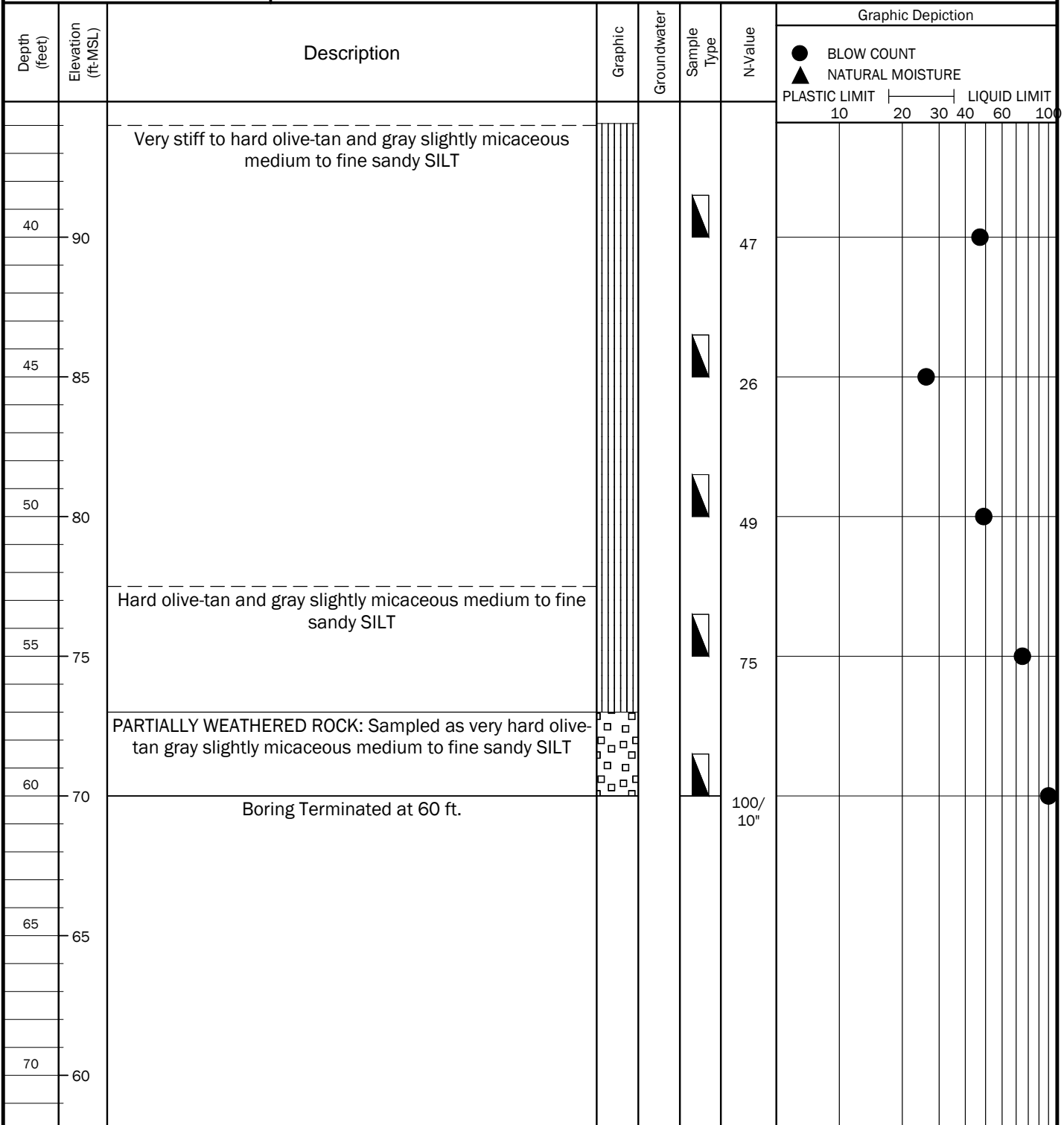




**TEST BORING
RECORD
B-7**

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 130 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-25-2021
 DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: 10.5 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

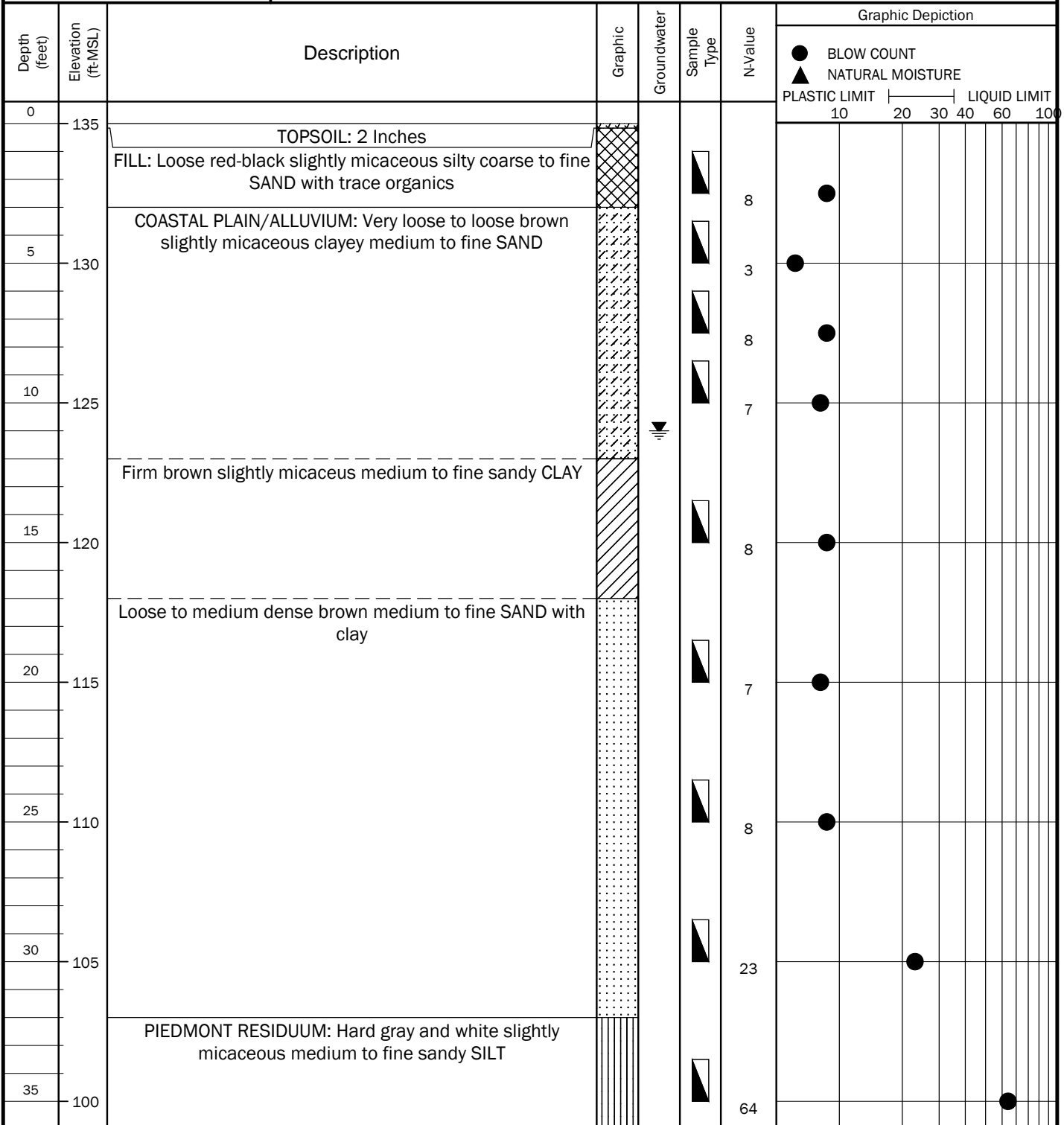




TEST BORING RECORD B-8

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 135 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-22-2021
 DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: 11 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.





**TEST BORING
RECORD
B-8**

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 135 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-22-2021
 DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: 11 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

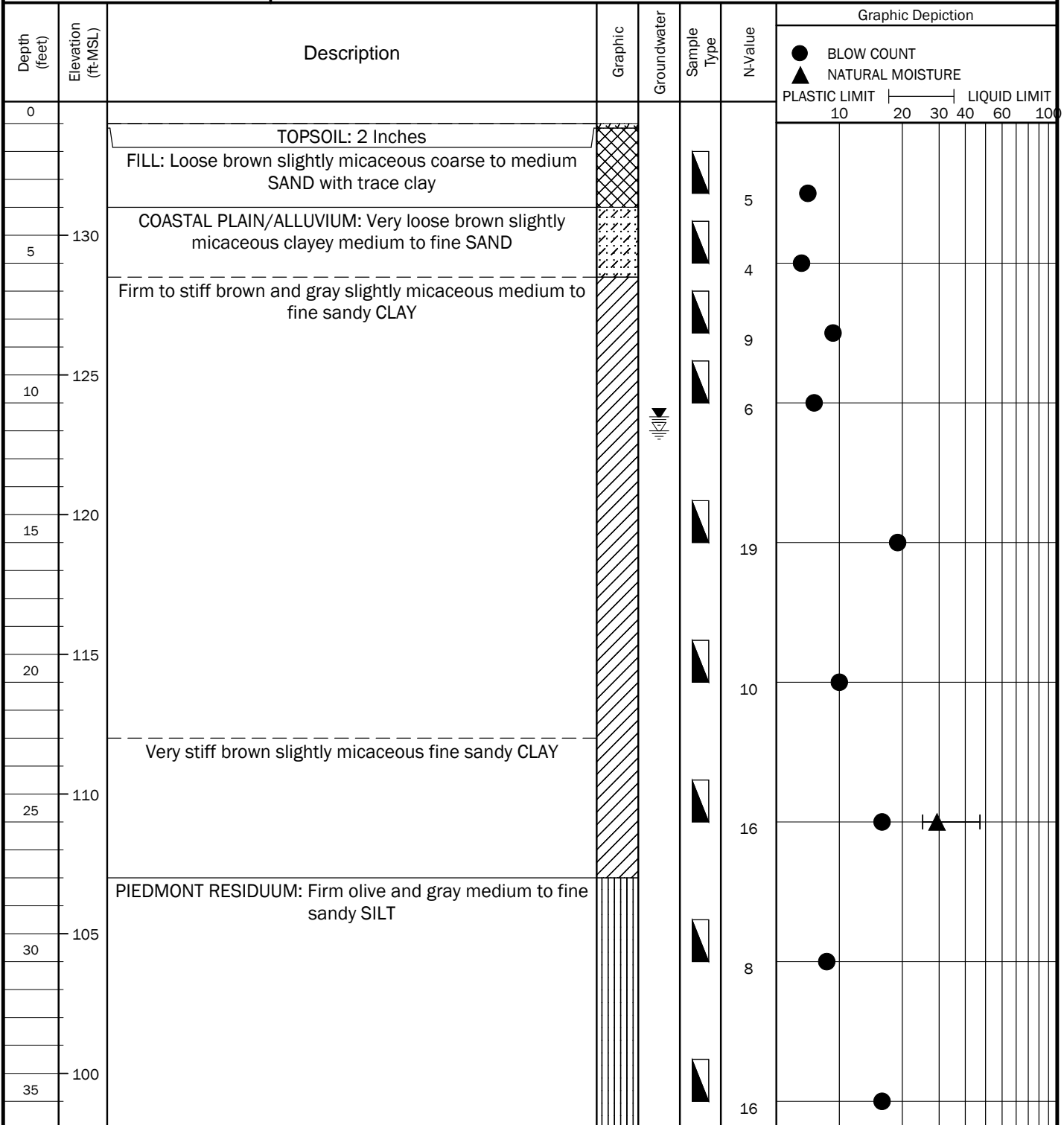
Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value	Graphic Depiction	
							● BLOW COUNT	▲ NATURAL MOISTURE
							PLASTIC LIMIT	LIQUID LIMIT
							10 20 30 40 60 100	10 20 30 40 60 100
40	95	Very hard gray and white slightly micaceous medium to fine sandy SILT				68		
45	90	PARTIALLY WEATHERED ROCK: Sampled as very hard light red and brown and white medium to fine sandy SILT				100/10"		
50	85					100/10"		
55	80					100/10"		
60	75	Boring Terminated at 60 ft.				100/10"		
65	70							
70	65							



TEST BORING RECORD B-9

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 134 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-22-2021
 DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: 10.5 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

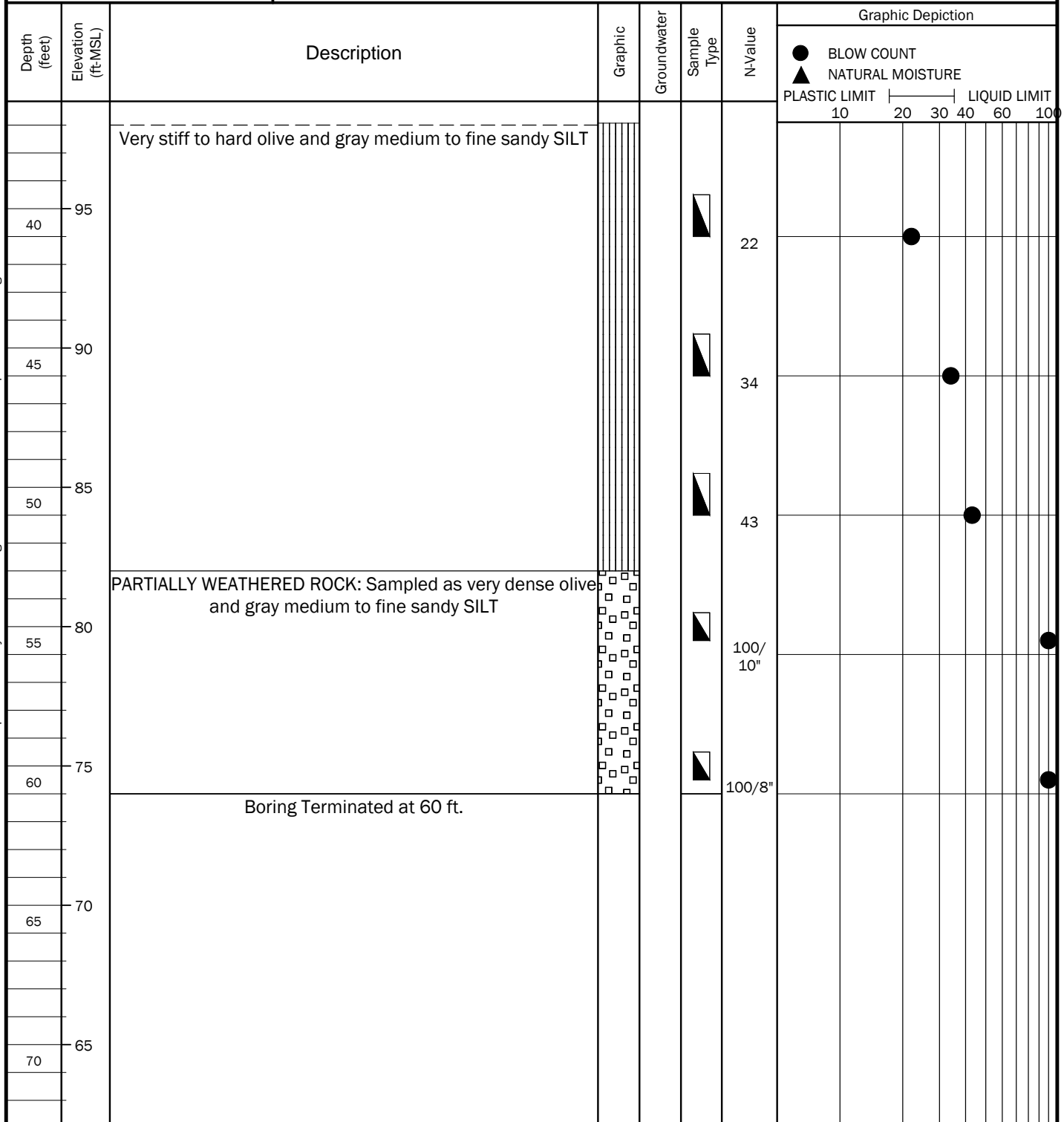




TEST BORING RECORD B-9

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 134 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-22-2021
 DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: 10.5 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

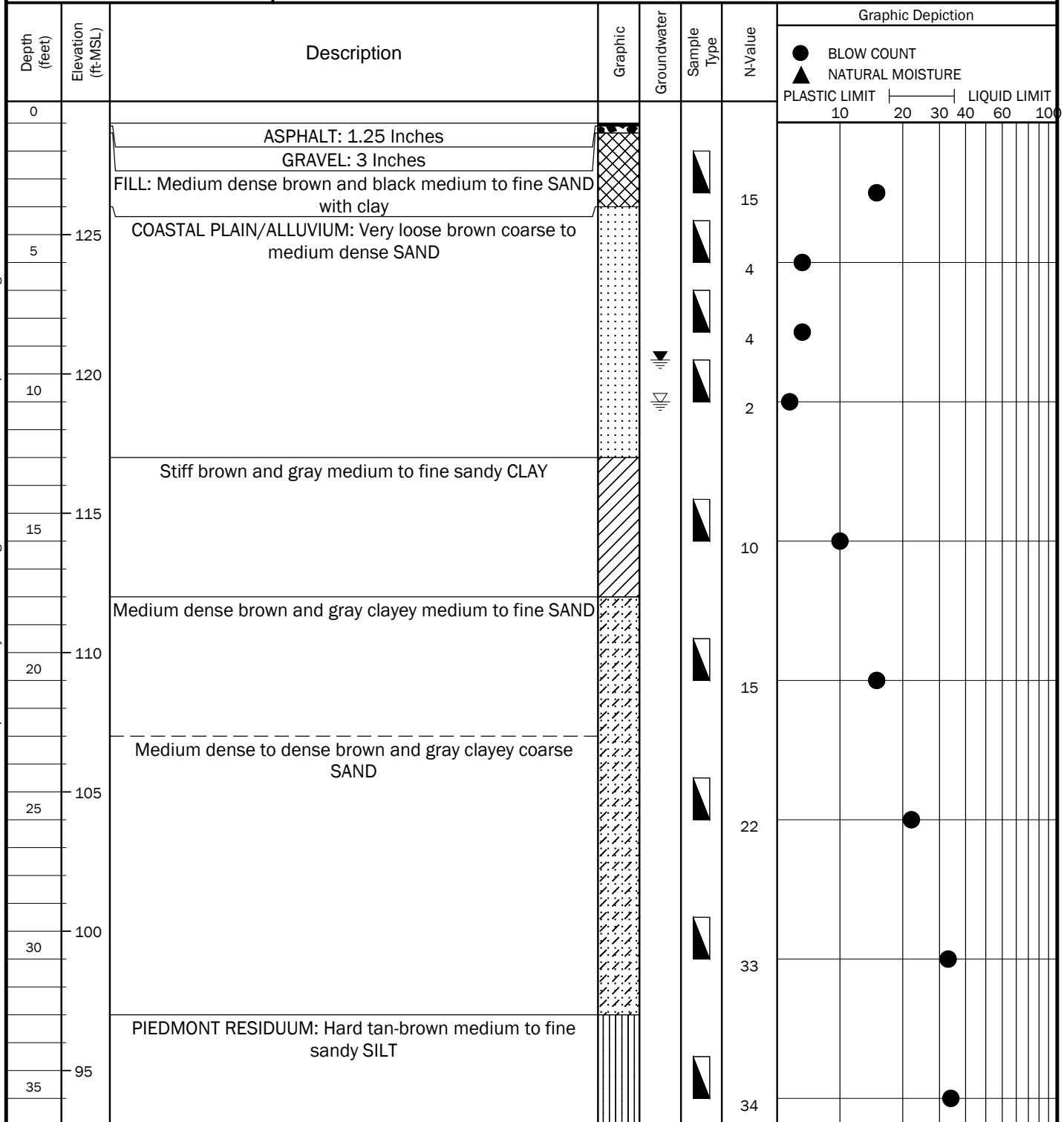




TEST BORING RECORD B-10

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 129 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-25-2021
 DEPTH TO - WATER> INITIAL: 10 AFTER 24 HOURS: 8.5 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.





TEST BORING RECORD B-10

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Building Boring ELEVATION: 129 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-25-2021
 DEPTH TO - WATER> INITIAL: 10 AFTER 24 HOURS: 8.5 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

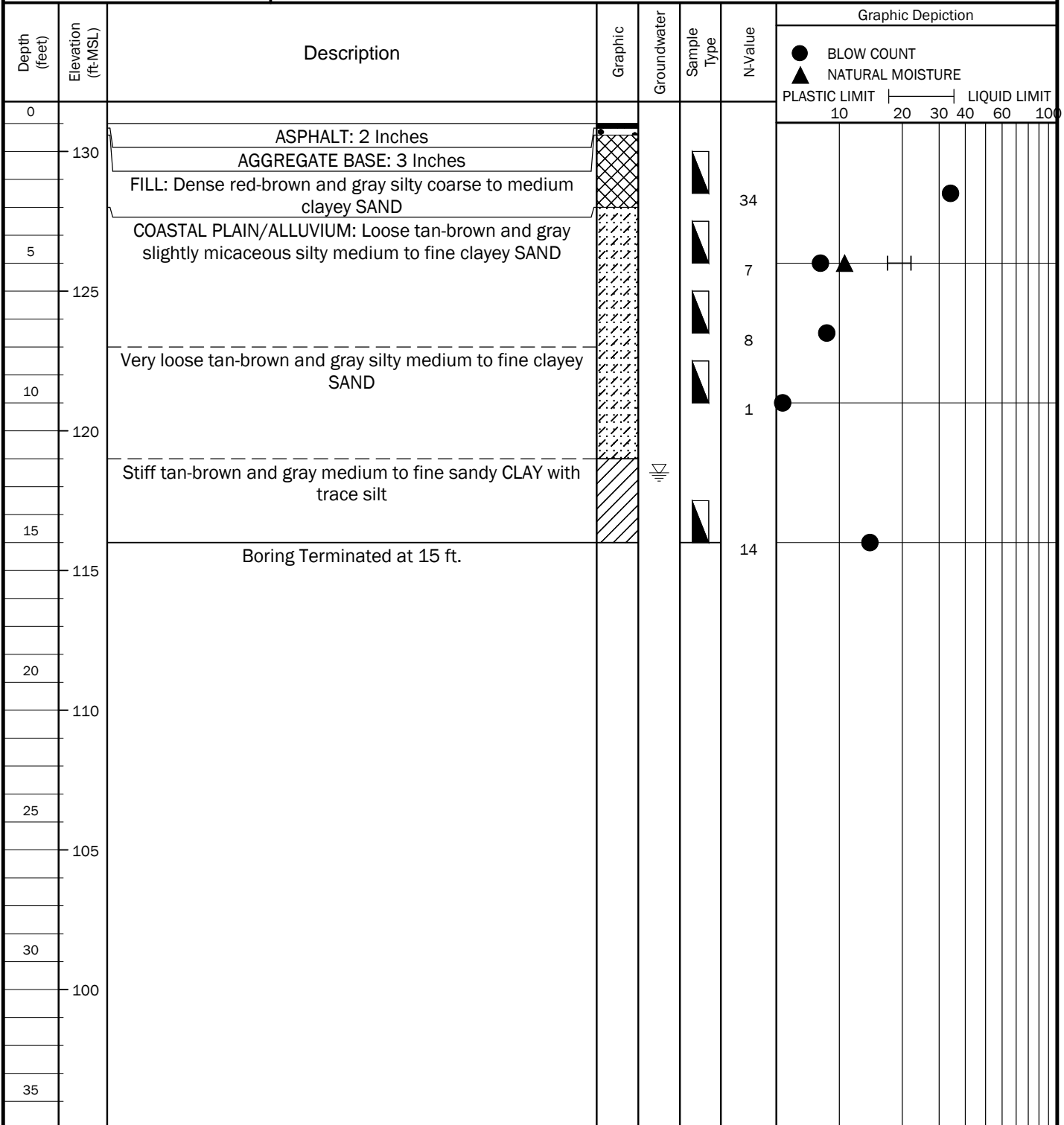
Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value	Graphic Depiction	
							● BLOW COUNT	▲ NATURAL MOISTURE
40	90	Very hard olive-gray and brown slightly micaceous medium to fine sandy SILT				62	●	
45	85	PARTIALLY WEATHERED ROCK: Sampled as very hard olive brown and gray slightly micaceous medium to fine sandy SILT				100/8"	●	
50	80	Auger Refusal at 50 ft.				100/6"	●	
55	75							
60	70							
65	65							
70	60							



TEST BORING RECORD B-16

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Street Boring ELEVATION: 131 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-21-2021
 DEPTH TO - WATER> INITIAL: 12.5 AFTER 24 HOURS: CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

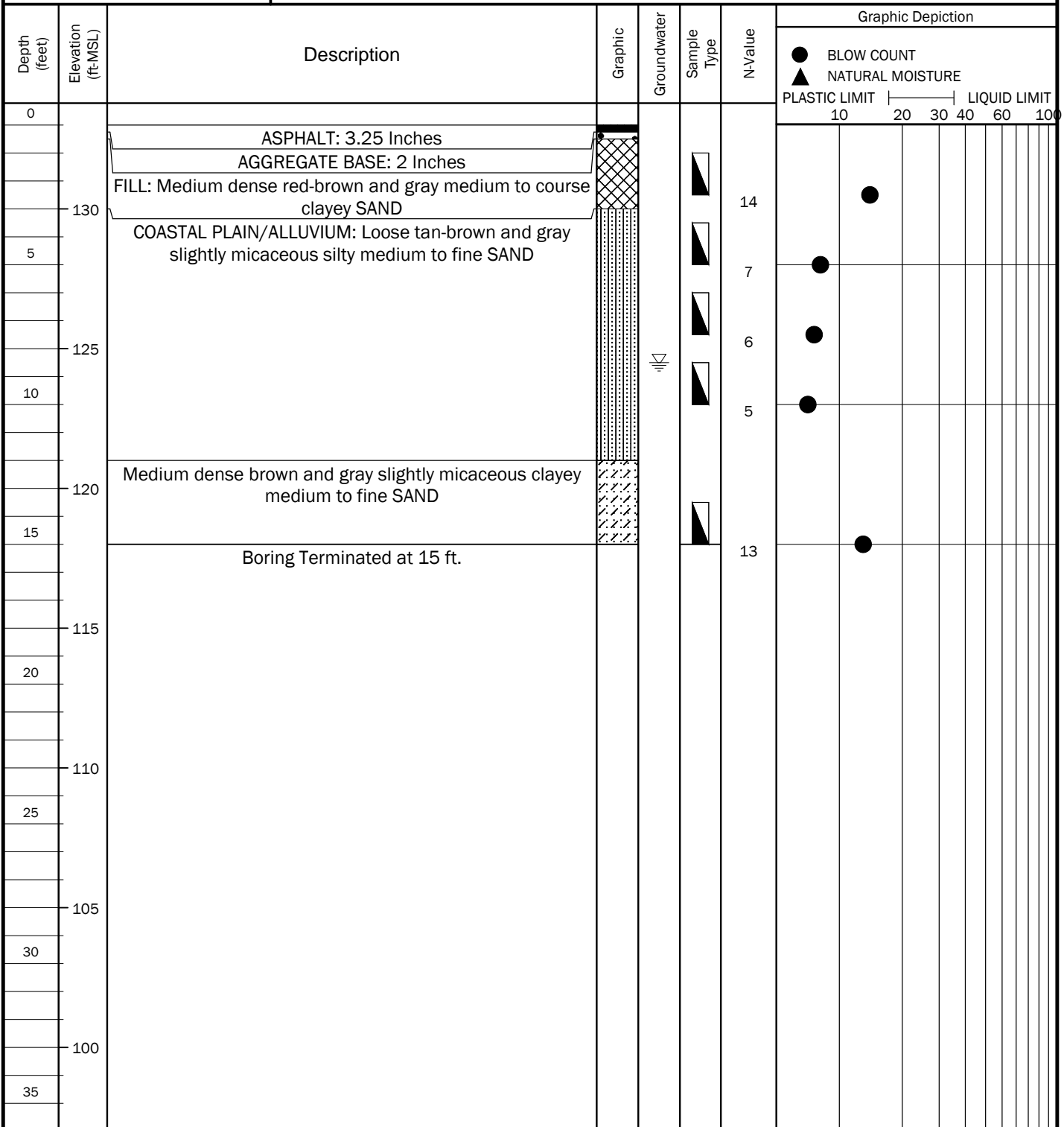




TEST BORING RECORD B-17

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Parking Boring ELEVATION: 133 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-21-2021
 DEPTH TO - WATER> INITIAL: 8.5 AFTER 24 HOURS: CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.





TEST BORING RECORD B-18

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Parking Boring ELEVATION: 129 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-21-2021
 DEPTH TO - WATER> INITIAL: 7.5 AFTER 24 HOURS: 7.5 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value	Graphic Depiction					
							● BLOW COUNT	▲ NATURAL MOISTURE	PLASTIC LIMIT	LIQUID LIMIT		
							10	20	30	40	60	100
0		ASPHALT: 1.75 Inches										
		GRAVEL: 3 Inches										
		FILL: Loose brown and gray slightly micaceous clayey medium to fine SAND										
5	125	COASTAL PLAIN/ALLUVIUM: Very loose to loose tan-brown slightly micaceous silty medium to fine SAND with trace clay				7	●					
						7	●					
						2	●					
10	120	Soft tan-brown slightly micaceous fine sandy CLAY				3	●					
		Boring Terminated at 10 ft.										
15	115											
20	110											
25	105											
30	100											
35	95											



TEST BORING RECORD B-19

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Parking Boring ELEVATION: 130 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-21-2021
 DEPTH TO - WATER> INITIAL: 8.5 AFTER 24 HOURS: 7.0 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

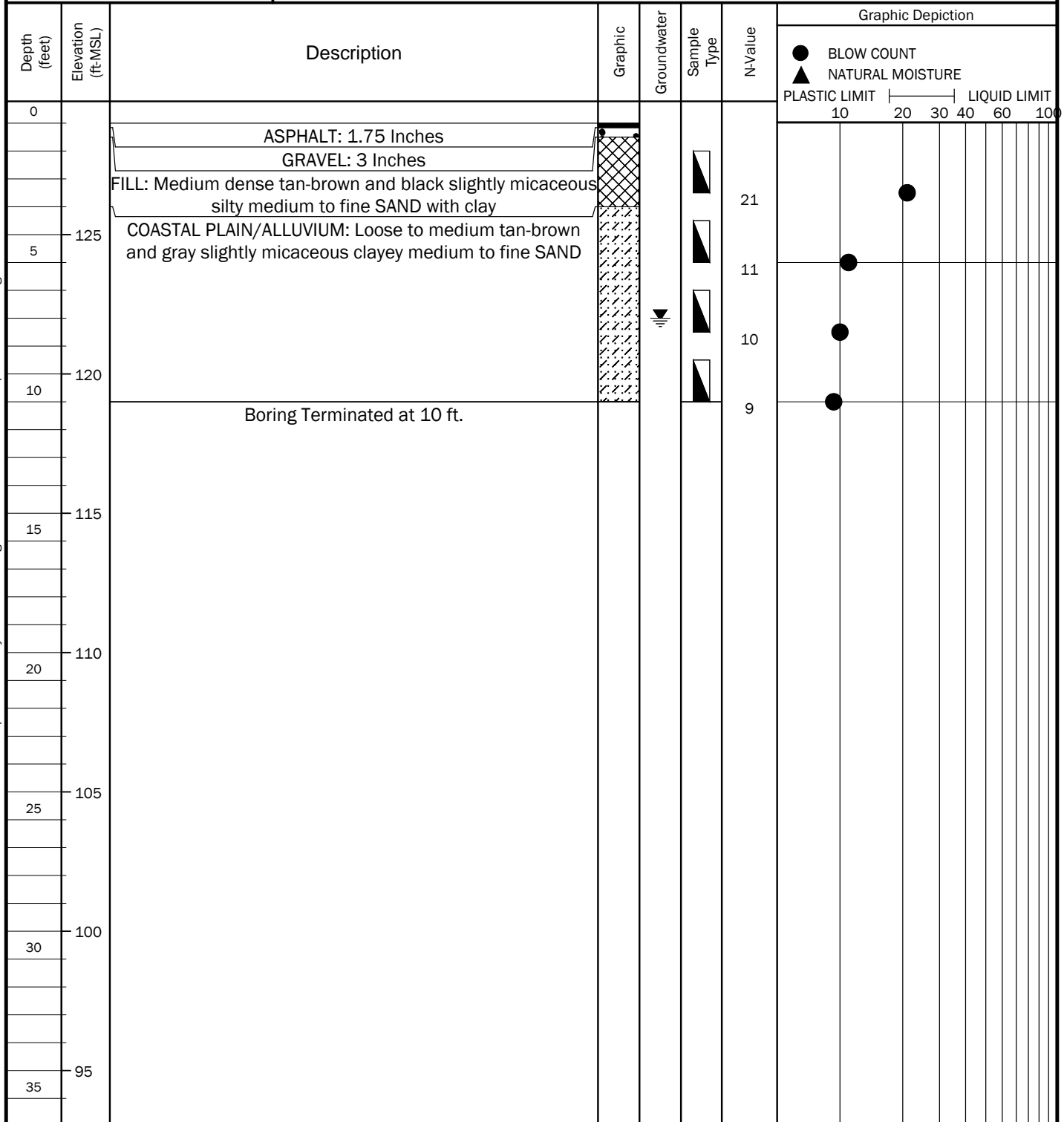
Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value	Graphic Depiction													
							● BLOW COUNT	▲ NATURAL MOISTURE	PLASTIC LIMIT					LIQUID LIMIT						
0	130	ASPHALT: 1.75 Inches GRAVEL: 3 Inches FILL: Loose brown and gray slightly micaceous clayey medium to fine SAND																		
5	125	COASTAL PLAIN/ALLUVIUM: Loose tan-brown slightly micaceous silty medium to fine SAND with clay				9	●													
		Loose tan-brown and gray slightly micaceous silty medium to fine sandy CLAY				6	●													
10	120	Boring Terminated at 10 ft.				7	●													
						6	●													
15	115																			
20	110																			
25	105																			
30	100																			
35	95																			



TEST BORING RECORD B-20

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Parking Boring ELEVATION: 129 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-21-2021
 DEPTH TO - WATER> INITIAL: 7.0 AFTER 24 HOURS: 7.0 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

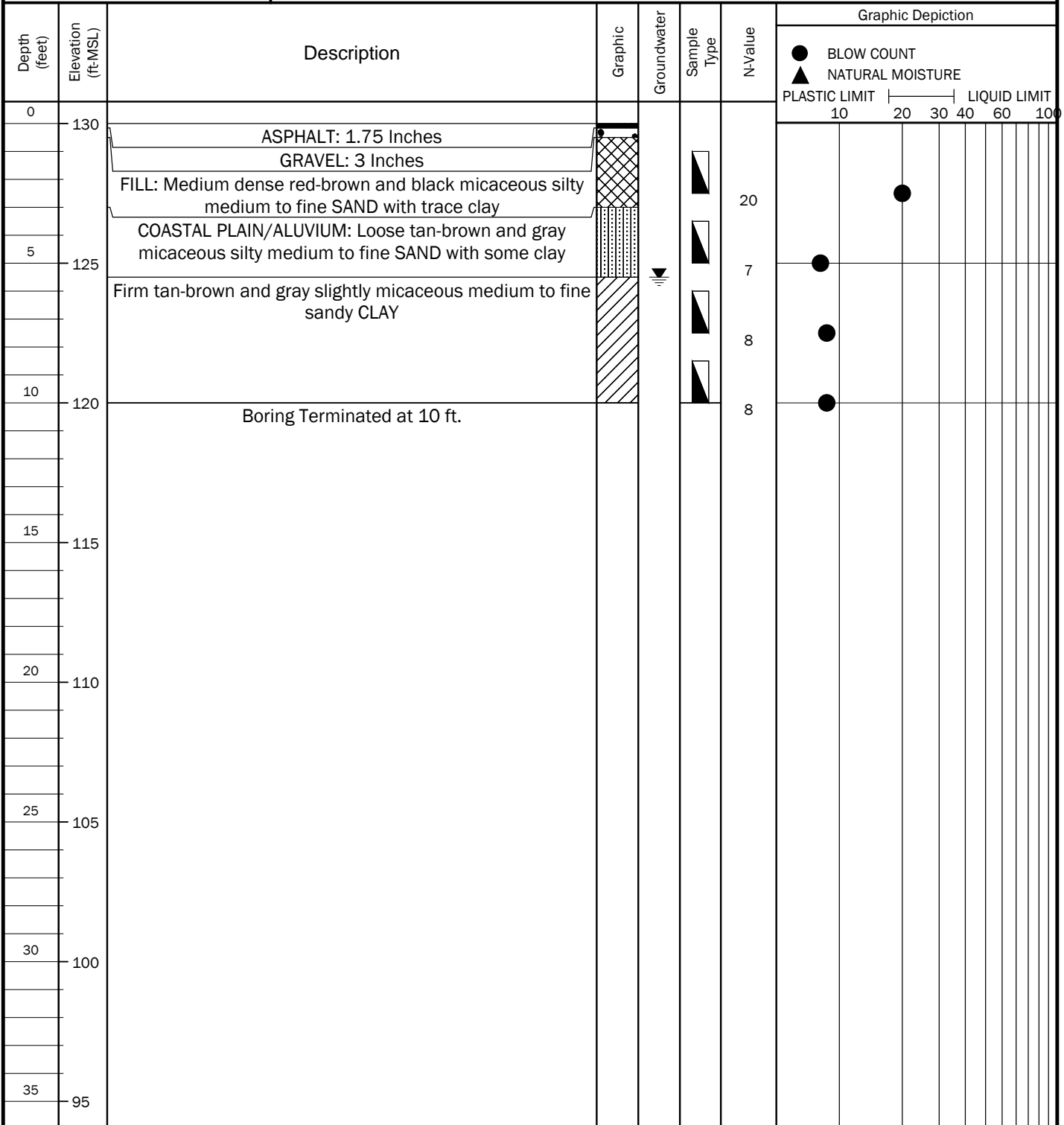




TEST BORING RECORD B-21

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Parking Boring ELEVATION: 130 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-21-2021
 DEPTH TO - WATER> INITIAL: NE AFTER 24 HOURS: 5.5 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

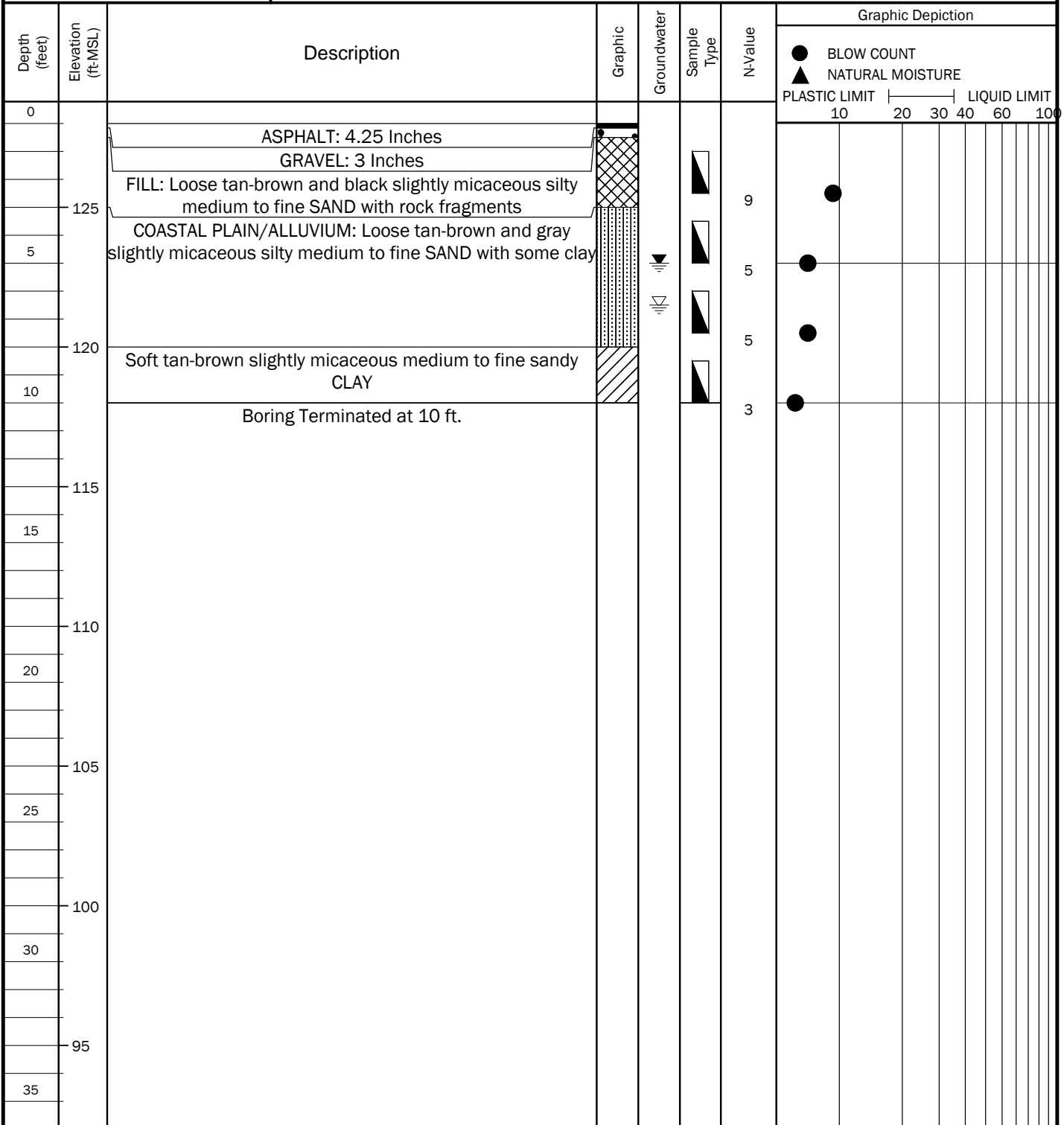




TEST BORING RECORD B-23

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Parking Boring ELEVATION: 128 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-21-2021
 DEPTH TO - WATER> INITIAL: 6.5 AFTER 24 HOURS: 5.0 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

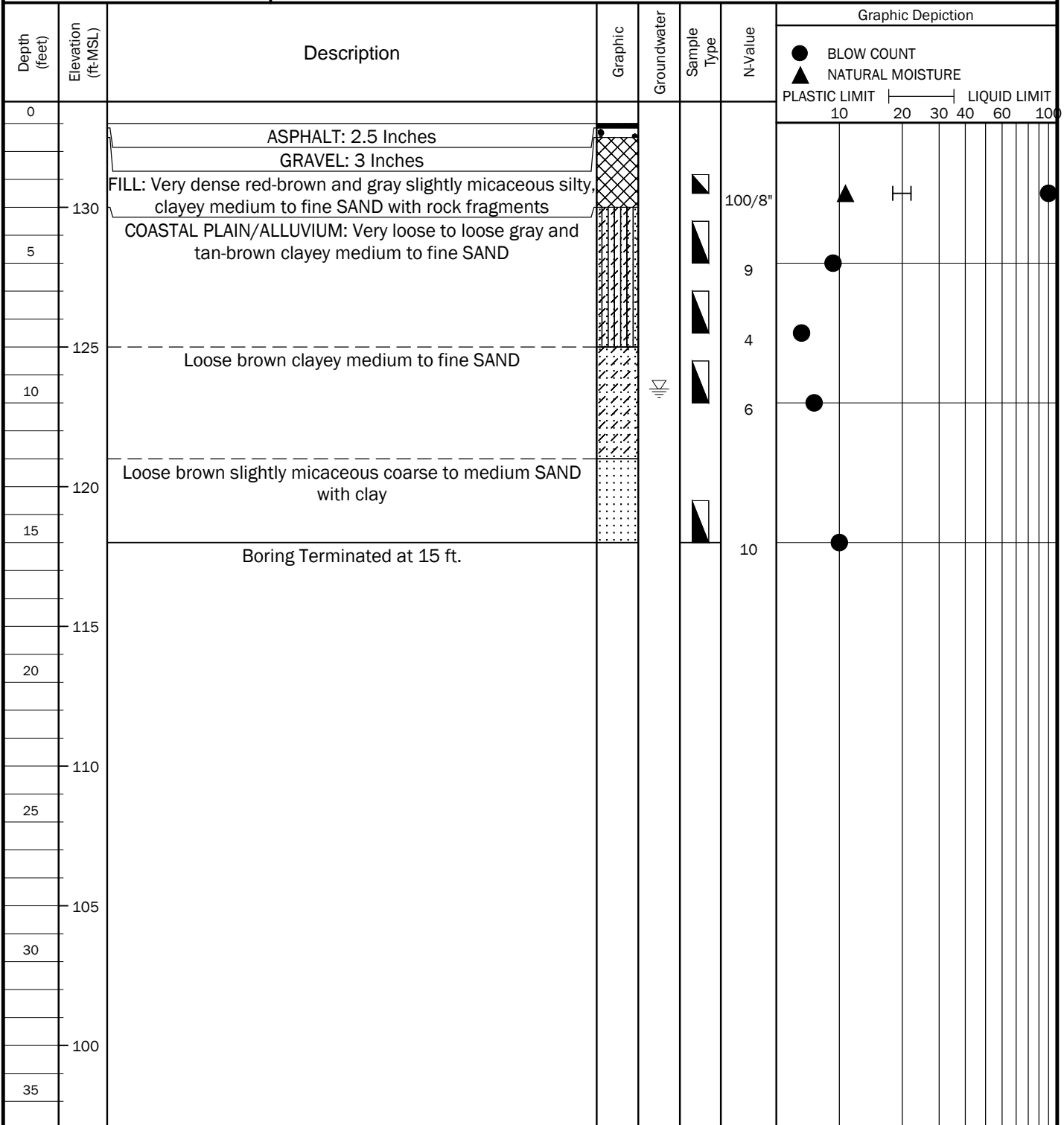




TEST BORING RECORD B-24

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Street Boring ELEVATION: 133 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-21-2021
 DEPTH TO - WATER> INITIAL: 9.5 AFTER 24 HOURS: CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

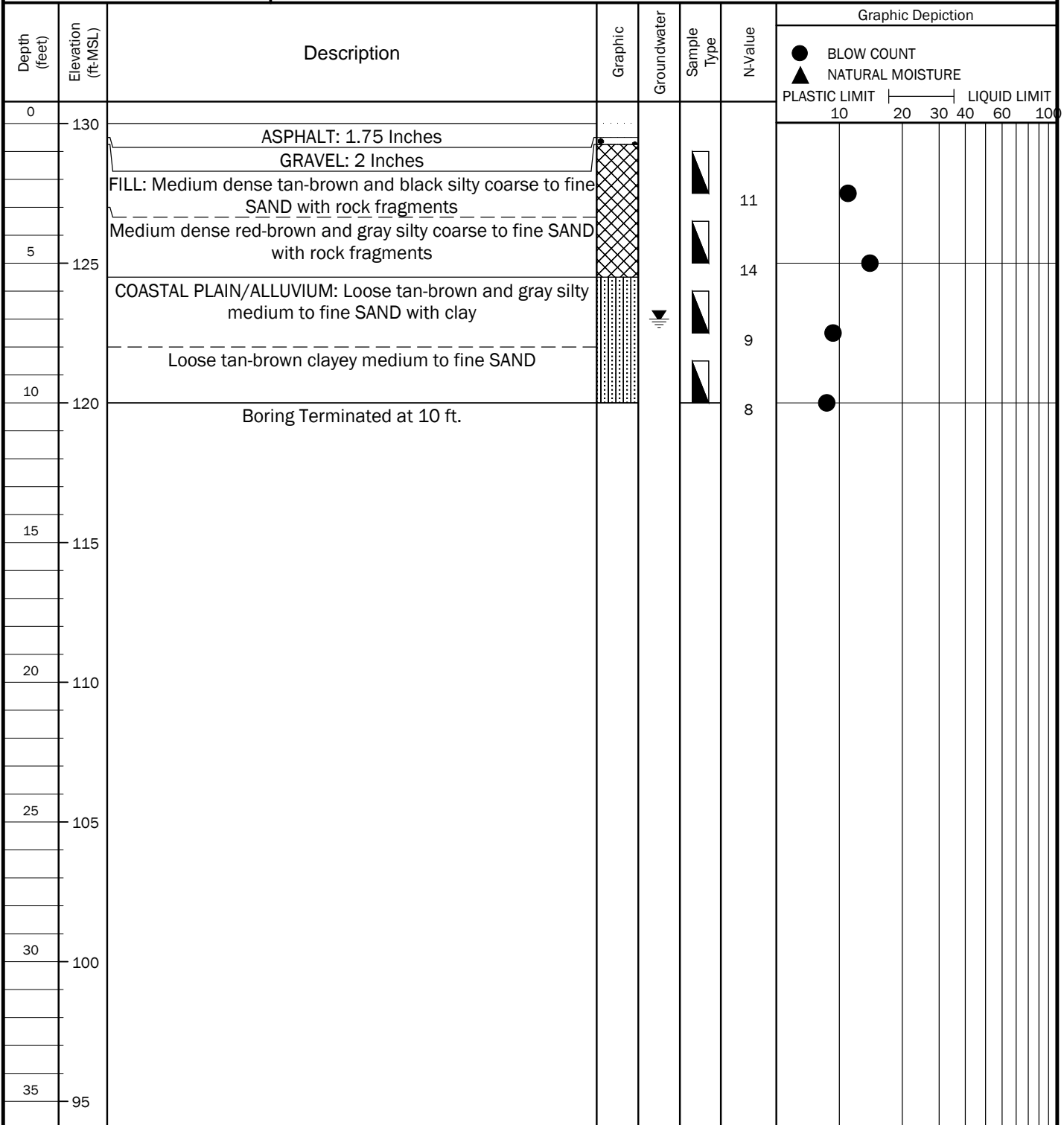




TEST BORING RECORD B-25

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Parking Boring ELEVATION: 130 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-21-2021
 DEPTH TO - WATER> INITIAL: NE AFTER 24 HOURS: 7.0 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.





TEST BORING RECORD B-26

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Parking Boring ELEVATION: 130 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-21-2021
 DEPTH TO - WATER> INITIAL: NE AFTER 24 HOURS: 8.5 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value	Graphic Depiction					
							● BLOW COUNT	▲ NATURAL MOISTURE	PLASTIC LIMIT	LIQUID LIMIT		
							10	20	30	40	60	100
0	130	ASPHALT: 1.75 Inches GRAVEL: 3 Inches FILL: Loose red-brown and black slightly micaceous silty medium to fine SAND with rock fragments										
5	125	COASTAL PLAIN/ALLUVIUM: Very loose to loose tan-brown and gray slightly micaceous silty medium to fine SAND with clay										
10	120	Boring Terminated at 10 ft.										
15	115											
20	110											
25	105											
30	100											
35	95											



TEST BORING RECORD B-27

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Parking Boring ELEVATION: 130 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-21-2021
 DEPTH TO - WATER> INITIAL: NE AFTER 24 HOURS: 8.5 CAVING> C.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value	Graphic Depiction													
							● BLOW COUNT	▲ NATURAL MOISTURE	PLASTIC LIMIT	LIQUID LIMIT										
0	130	ASPHALT: 1.75 Inches GRAVEL: 3 Inches																		
		FILL: Very loose red-brown and black slightly micaceous silty medium to fine SAND with rock fragments				3	●													
5	125	COASTAL PLAIN/ALLUVIUM: Firm tan-brown and gray slightly micaceous medium to fine sandy CLAY				5	●													
		Loose tan-brown and gray coarse to fine clayey SAND				7	●													
10	120	Boring Terminated at 10 ft.				6	●													
15	115																			
20	110																			
25	105																			
30	100																			
35	95																			



TEST BORING RECORD B-28

PROJECT: James Brown Arena PROJECT NO.: 10103-2021003
 CLIENT: H.J. Russell & Company
 PROJECT LOCATION: Augusta, GA
 LOCATION: Parking Boring ELEVATION: 130 FT-MSL
 DRILLER: Betts Environmental Revocery, Inc. LOGGED BY: MM
 DRILLING METHOD: Hollow-Stem Auger DATE: 1-21-2021
 DEPTH TO - WATER> INITIAL: NE AFTER 24 HOURS: CAVING> C.

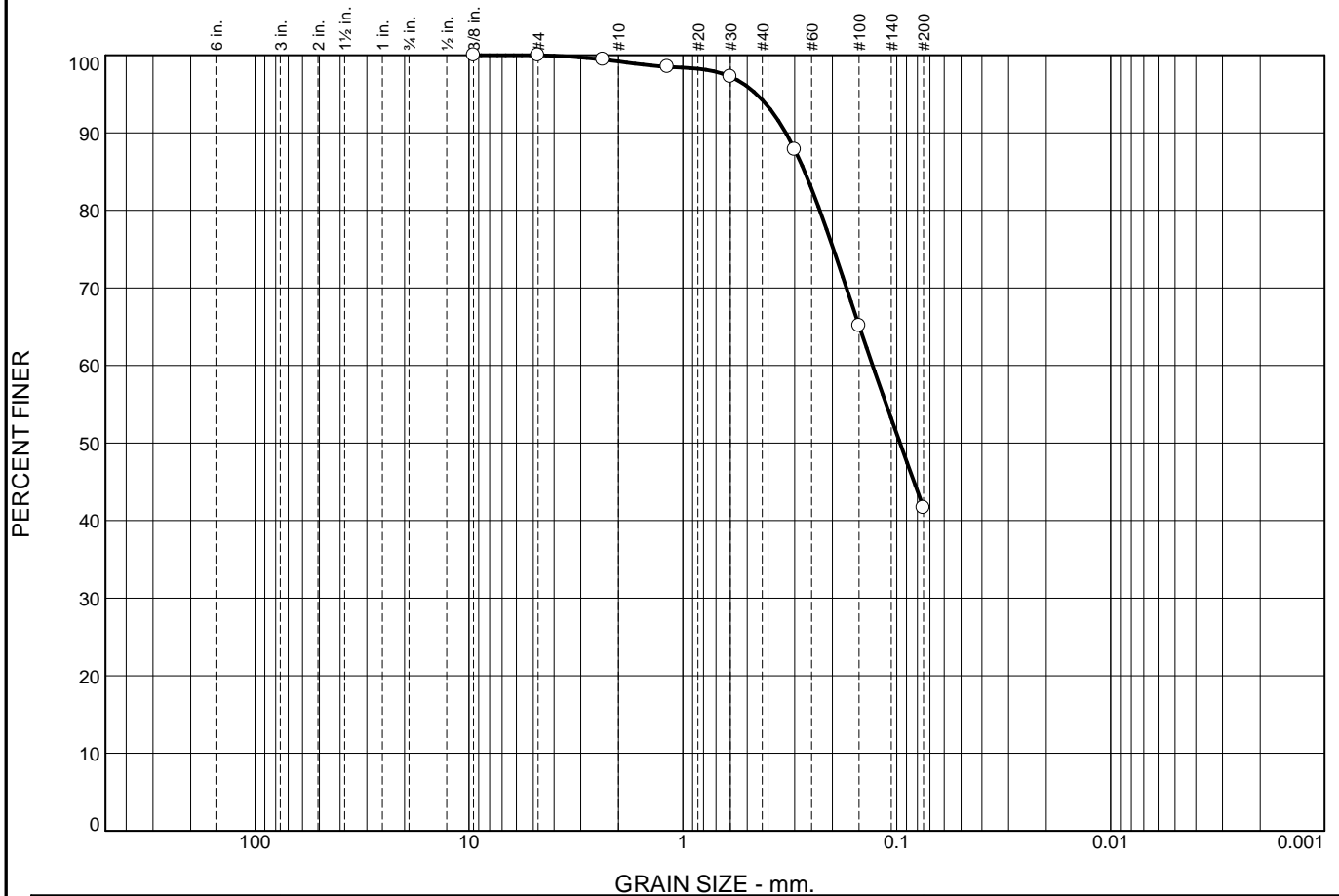
This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value	Graphic Depiction					
							● BLOW COUNT	▲ NATURAL MOISTURE	PLASTIC LIMIT	LIQUID LIMIT		
							10	20	30	40	60	100
0	130	ASPHALT: 2 Inches GRAVEL: 3 Inches										
		FILL: Medium dense tan-brown and gray slightly micaceous coarse to medium SAND with clay and rock fragments				15	●					
5	125	COASTAL PLAIN/ALLUVIUM: Very loose to loose tan-brown and gray silty medium to fine SAND with trace clay				7	●					
		Firm tan-brown and gray slightly micaceous medium to fine sandy CLAY				4	●					
10	120	Boring Terminated at 10 ft.				7	●					
15	115											
20	110											
25	105											
30	100											
35	95											

APPENDIX C

Laboratory Data

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.8	5.0	52.5	41.7	

LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
		0.2696	0.1296	0.0965					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM

Project No. 2021003 **Client:** H.J. Russell & Company
Project: James Brown Arena

Source of Sample: B-3 **Depth:** 13.5-15 **Sample Number:** SA-02

Nova Engineering & Environmental
Norcross, GA

Remarks:
 ○ Boring 3, Sample 5

Figure



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Tested By	KP
Date	01/28/21
Checked By	<i>16</i>

Client Pr. #	2021003	Lab. PR. #	2104A-05-1
Project Name	James Brown Arena	S. Type	UD
Sample ID	37082/B-3	Depth/Elev.	17-19'
Location	B-3	Add. Info	-

ASTM D2435

Standard Test Method for One-Dimensional Consolidation Properties of Soils (Method B)

Sample Data

	Initial	Final		
Mass of Ring, g	194.73	194.73	Initial Seating Pressure, lbf/ft ²	100
Mass of Wet Sample and Ring, g	353.92	351.01	Additional Vertical Pressure, lbf/ft ²	0
Mass of Wet Sample, g	159.19	156.28	Total Seating Pressure, lbf/ft ²	100
Mass of Dry Sample, g	130.98	130.98	STATION #	1
Height of Sample, in	0.9970	0.9449	Consolidometer Ring ID Number	1
Diameter of Sample, in	2.501	2.501	Consolidometer ID Number	1
Area of Sample, in ²	4.91	4.91	Frame ID Number	103
Volume of Sample, in ³	4.90	4.64	Dial Gage ID Number	676
Specific Gravity (Assumed)	2.700	2.700		
Wet Unit Weight, pcf	123.8	128.3	Initial Dial Gauge Reading, 10 ⁻⁴ in	0
Dry Unit Weight, pcf	101.9	107.5	Final Dial Gauge Reading, 10 ⁻⁴ in	521
Height of Solids, in	0.6026	0.6026		
Height of Voids, in	0.3944	0.3423		
Height of Water, in	0.3504	0.3141		
Void Ratio	0.654	0.568		
Degree of Saturation, %	88.8	91.8		

DESCRIPTION

NA

USCS (ASTM D2487;2488)

NA

REMARKS

Portion of sample used for testing was located 12" above the bottom of the Shelby tube.

Moisture Content

	Trimmings	Initial	Final		
Mass of Wet Sample and Tare, g	485.20	353.92	463.53	LL	-
Mass of Dry Sample and Tare, g	415.80	325.71	438.24	PL	-
Mass of Tare, g	99.40	194.73	307.29	PI	-
Moisture Content, %	21.9	21.5	19.3		



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Tested By: KP
Date: 01/28/21
Checked By: *[Signature]*

Client Pr. #	2021003	Lab Pr. #	2104A-05-1
Project Name	James Brown Arena	S. Type	UD
Sample ID	37082/B-3	Depth/Elev.	17-19'
Location	B-3	Add. Info	-

ASTM D2435

Standard Test Method for One-Dimensional Consolidation Properties of Soils (Method B)

Void Ratio, Strain Information and Coefficient of Consolidation Calculation

Pressure		Uncorrected Dial Reading, in		Apparatus Correction, in	Corrected Dial Reading, in		Change in specimen height, in		Sample Height, in		Height of Voids, in	Void Ratio		Strain, %		Fitting Time, min		Hd ₅₀ , in	Coefficient of Consolidation		
lbf/ft ²	Ksf	d ₁₀₀	d ₅₀		d ₁₀₀	d ₅₀	SD H ₁₀₀	SD H ₅₀	H ₁₀₀	H ₅₀	Hv ¹⁰⁰ , in	e ₁₀₀	e ₅₀	e ₁₀₀	e ₅₀	t ₉₀	t ₅₀		in ² /min	ft ² /day	
100	0.1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9970	0.9970	0.3944	0.654	0.654	0.00	0.00	-	-	0.4985	-	-	
250	0.25	0.0030	0.0022	0.0000	0.0030	0.0022	0.0030	0.0022	0.9940	0.9948	0.3914	0.649	0.651	0.30	0.22	2.40	0.56	0.4974	0.09	0.87	
500	0.5	0.0077	0.0068	0.0000	0.0077	0.0068	0.0077	0.0068	0.9893	0.9902	0.3867	0.642	0.643	0.77	0.68	2.89	0.67	0.4951	0.07	0.72	
1000	1	0.0154	0.0133	0.0000	0.0154	0.0133	0.0154	0.0133	0.9816	0.9837	0.3789	0.629	0.632	1.55	1.34	15.21	3.55	0.4918	0.01	0.13	
250	0.25	0.0152	0.0153	0.0000	0.0152	0.0153	0.0152	0.0153	0.9818	0.9817	0.3792	0.629	0.629	1.53	1.53	0.49	0.11	0.4909	0.42	4.17	
500	0.5	0.0158	0.0157	0.0000	0.0158	0.0157	0.0158	0.0157	0.9812	0.9813	0.3786	0.628	0.628	1.58	1.57	0.49	0.11	0.4907	0.42	4.17	
1000	1	0.0164	0.0162	0.0000	0.0164	0.0162	0.0164	0.0162	0.9806	0.9808	0.3779	0.627	0.628	1.65	1.63	2.56	0.60	0.4904	0.08	0.80	
2000	2	0.0229	0.0214	0.0000	0.0229	0.0214	0.0229	0.0214	0.9741	0.9756	0.3715	0.616	0.619	2.30	2.15	3.24	0.76	0.4878	0.06	0.62	
4000	4	0.0366	0.0340	0.0000	0.0366	0.0340	0.0366	0.0340	0.9604	0.9630	0.3578	0.594	0.598	3.67	3.41	4.00	0.93	0.4815	0.05	0.49	
8000	8	0.0521	0.0492	0.0000	0.0521	0.0492	0.0521	0.0492	0.9449	0.9478	0.3423	0.568	0.573	5.22	4.94	5.29	1.23	0.4739	0.04	0.36	

Note: d₁₀₀ = Dial gauge reading at 100% primary consolidation, in
 d₅₀ = Dial gauge reading at 50% primary consolidation, in
 H₁₀₀ = Specimen height at 100% primary consolidation, in
 H₅₀ = Specimen height at 50% primary consolidation, in
 Hd₅₀ = Length of the drainage path at 50% consolidation, in
 e₁₀₀ = Void ratio at 100% primary consolidation
 e₅₀ = Void ratio at 50% primary consolidation



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Tested By KP

Date 01/28/21

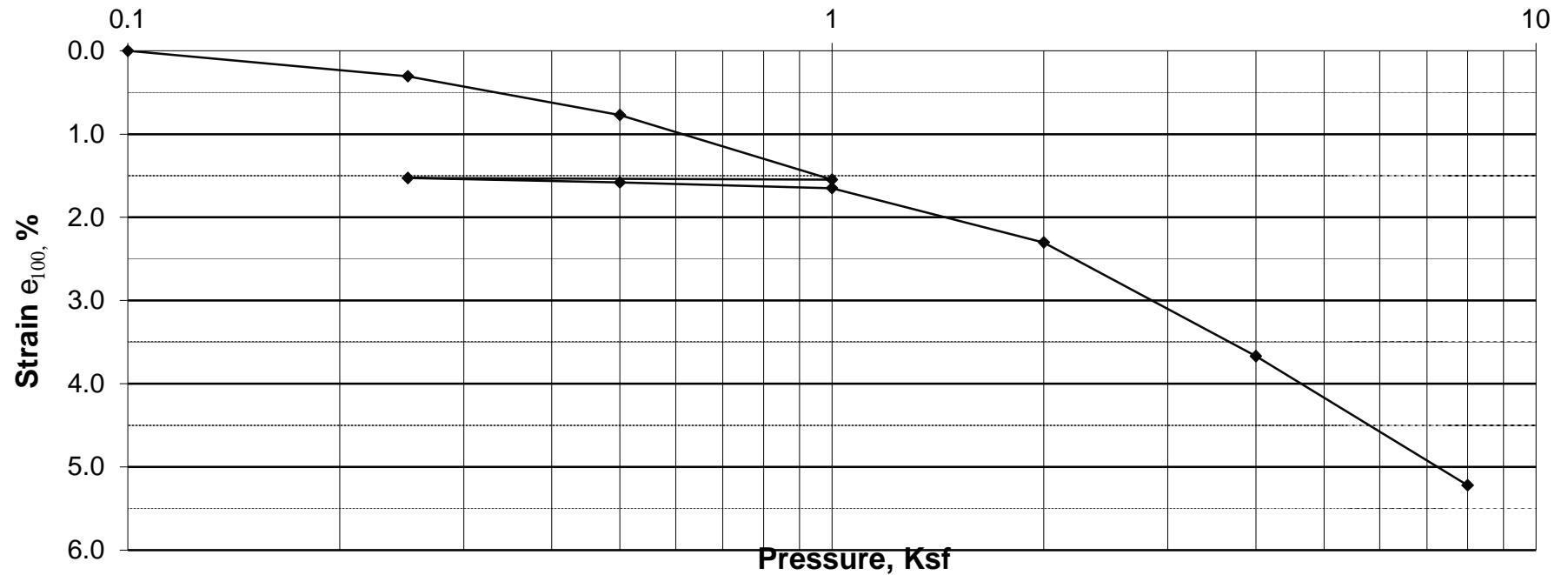
Checked By *[Signature]*

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	17-19'
Add. Info	-

ASTM D 2435; Standard Test Method for One-Dimensional Consolidation Properties of Soils (Method B)

Strain at the End-of-Primary Consolidation vs. Log of Pressure





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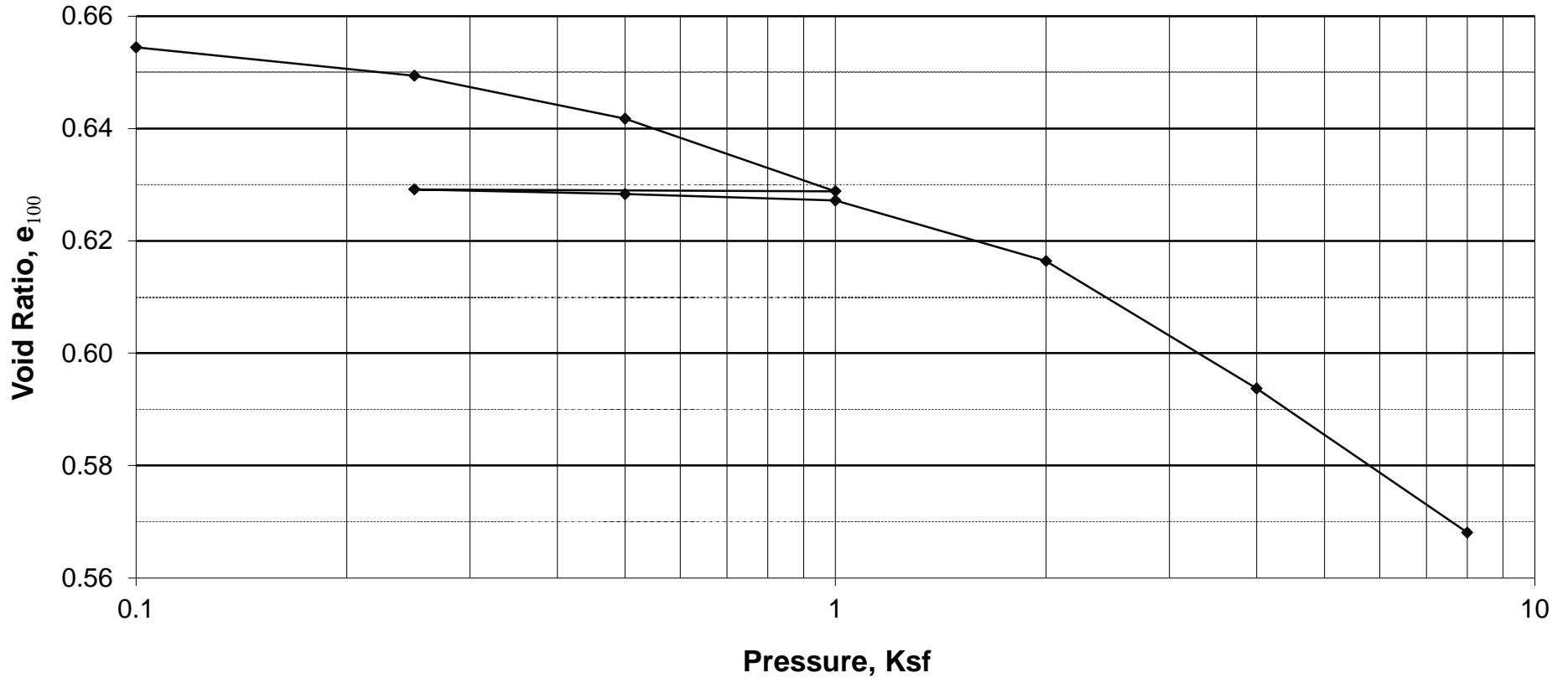
Tested By	KP
Date	01/28/21
Checked By	<i>LB</i>

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	17-19'
Add. Info	-

ASTM D 2435; Standard Test Method for One-Dimensional Consolidation Properties of Soils (Method B)

Void Ratio vs. Log of Pressure





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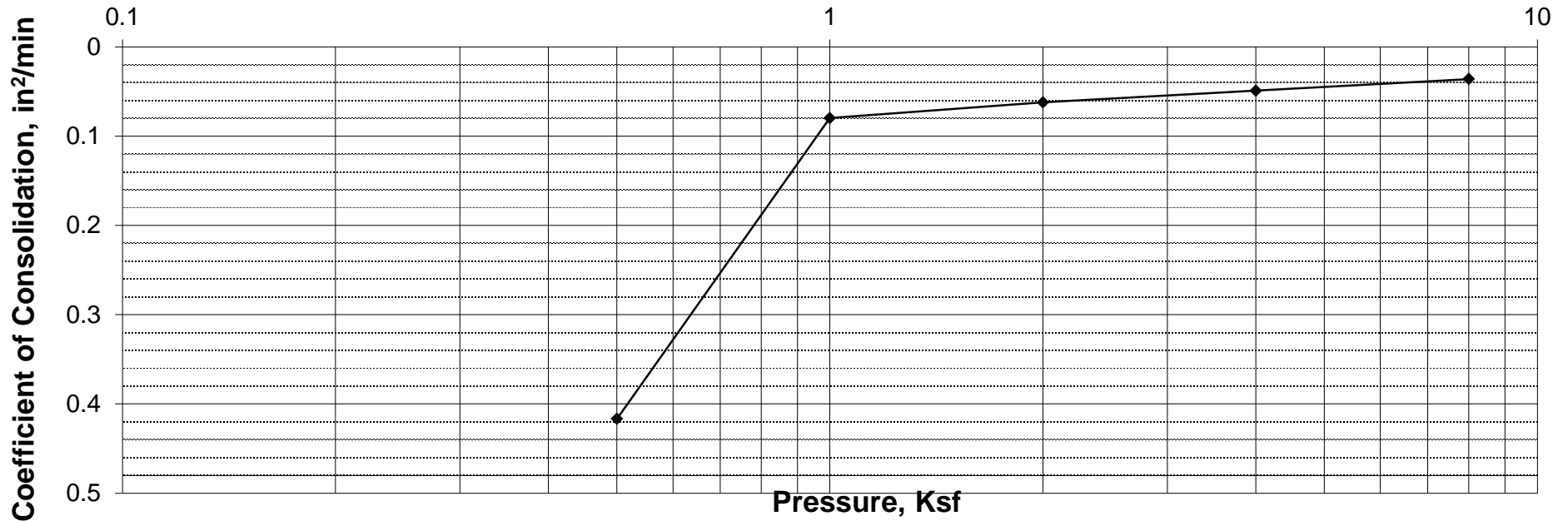
Tested By	KP
Date	01/28/21
Checked By	<i>[Signature]</i>

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	17-19'
Add. Info	-

ASTM D 2435; Standard Test Method for One-Dimensional Consolidation Properties of Soils (Method B)

Coefficient of Consolidation vs. Log of Pressure





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Tested By: EB/KP
Date: 01/29/21
Checked By: *EB*

ASTM D 4767/AASHTO T 297

Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (Multistage per ASTM STP 883)

Client Project #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Laboratory Project #	2104A-05-1
Sample Type	UD
Depth/Elev.	17-19'
Additional Info	-

SPECIMEN PROPERTIES

WATER CONTENT DETERMINATION

	(initial)	(after consol.)
Height, in	5.575	5.564
Diameter, in	2.875	2.845
Height-to-Diameter Ratio	1.9	2.0
Area, in ²	6.49	6.36
Volume, cm ³	593.08	579.48
Mass of Wet Sample, g	1091.20	1119.90
Mass of Dry Sample, g	858.31	858.31
Wet Density, pcf	114.9	120.6
Dry Density, pcf	90.3	92.5
Specific Gravity (assumed)	2.700	2.700
Volume of Solids, cm ³	317.89	317.89
Volume of Voids, cm ³	275.19	261.59
Void Ratio	0.87	0.82
% Saturation	84.6	100.0

	(initial)	(final)
Mass of Wet Sample and Tare, g	1091.20	1119.90
Mass of Dry Sample and Tare, g	858.31	858.31
Mass of Tare, g	0.00	0.00
Moisture, %	27.13	30.48

TEST DATA PRIOR TO LOADING

Volume change (Consolidation), ml	28.7
Machine Speed, in / min	0.0100
Strain Rate, % / min	0.18
Chamber Pressure, psi	85.0
Back Pressure, psi	80.0
Eff. Consol. Stress, (Minor pr. stress, s ₃), psi	5.0
Change in Height, in	0.011
"B" Value	0.95

SHEAR DATA

Elapsed Time (min)	Deformation Stage 1 (inch)	Axial Load (lb)	Pore-Water Pressure, psi		Total Strain Stage 1 (%)	Corrected Area (in ²)	Dev. Stress (D _s =s ₁ -s ₃) (psi)	Major Principal Stress, psi		Eff. Stress Ratio s' ₁ /s' ₃	P' (s' ₁ +s' ₃)/2 (psi)	Q (s ₁ -s ₃)/2 (psi)	Eff. Minor Pr. Stress s' ₃ (psi)
			Total, U	Change, DU				Total s ₁	Eff. s' ₁				
0.0	0.000	14.6	80.00	0.0	0.00	6.36	0.0	5.0	5.0	1.00	5.0	0.0	5.0
0.5	0.005	44.3	80.58	0.6	0.09	6.36	4.7	9.7	9.1	2.06	6.8	2.3	4.4
1.0	0.010	54.9	81.01	1.0	0.18	6.37	6.3	11.3	10.3	2.59	7.2	3.2	4.0
1.5	0.015	61.6	81.25	1.3	0.27	6.37	7.4	12.4	11.1	2.97	7.4	3.7	3.8
2.0	0.020	66.5	81.37	1.4	0.36	6.38	8.1	13.1	11.8	3.24	7.7	4.1	3.6
2.5	0.025	71.7	81.41	1.4	0.45	6.38	8.9	13.9	12.5	3.49	8.1	4.5	3.6
3.0	0.030	76.7	81.39	1.4	0.54	6.39	9.7	14.7	13.3	3.69	8.5	4.9	3.6
3.5	0.035	81.8	81.35	1.3	0.63	6.40	10.5	15.5	14.2	3.88	8.9	5.3	3.7
4.0	0.040	86.7	81.21	1.2	0.72	6.40	11.3	16.3	15.1	3.97	9.4	5.6	3.8
5.0	0.050	96.8	80.93	0.9	0.90	6.41	12.8	17.8	16.9	4.15	10.5	6.4	4.1
6.0	0.060	108.0	80.58	0.6	1.08	6.42	14.5	19.5	19.0	4.29	11.7	7.3	4.4
7.0	0.070	119.8	80.20	0.2	1.26	6.44	16.3	21.3	21.1	4.41	13.0	8.2	4.8
8.0	0.080	132.9	79.72	-0.3	1.44	6.45	18.3	23.3	23.6	4.47	14.5	9.2	5.3
9.0	0.090	146.0	79.21	-0.8	1.62	6.46	20.3	25.3	26.1	4.51	16.0	10.2	5.8
10.0	0.100	160.1	78.67	-1.3	1.80	6.47	22.5	27.5	28.8	4.55	17.6	11.2	6.3
11.0	0.110	174.5	78.08	-1.9	1.98	6.48	24.7	29.7	31.6	4.56	19.3	12.3	6.9
12.0	0.120	189.4	77.46	-2.5	2.16	6.50	26.9	31.9	34.5	4.57	21.0	13.5	7.5
13.0	0.130	205.0	76.79	-3.2	2.34	6.51	29.3	34.3	37.5	4.56	22.8	14.6	8.2

Values @ Failure: -2.5, 2.16, 6.50, 26.9, 31.9, 34.5, **4.57**, 21.0, 13.5, 7.5
 Failure criteria used* 3 *Note: "1" = Max Deviator Stress; "2" = Deviator Stress @ 15% Strain; "3" = Max Eff. Stress Ratio(s'/s')



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Tested By

EB/KP

Date

01/29/21

Checked By

ASTM D 4767/AASHTO T 297

Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (Multistage per ASTM STP 883)

Client Project #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Laboratory Project #	2104A-05-1
Sample Type	UD
Depth/Elev.	17-19'
Additional Info	-

SPECIMEN PROPERTIES

WATER CONTENT DETERMINATION

	(initial)	(after consol.)
Height, in	5.434	5.466
Diameter, in	2.878	2.855
Height-to-Diameter Ratio	1.9	1.9
Area, in ²	6.51	6.40
Volume, cm ³	579.48	573.28
Mass of Wet Sample, g	1119.90	1113.70
Mass of Dry Sample, g	858.31	858.31
Wet Density, pcf	120.6	121.3
Dry Density, pcf	92.5	93.5
Specific Gravity (assumed)	2.700	2.700
Volume of Solids, cm ³	317.89	317.89
Volume of Voids, cm ³	261.59	255.39
Void Ratio	0.82	0.80
% Saturation	100.0	100.0

	(initial)	(final)
Mass of Wet Sample and Tare, g	1119.90	1113.70
Mass of Dry Sample and Tare, g	858.31	858.31
Mass of Tare, g	0.00	0.00
Moisture, %	30.48	29.76

TEST DATA PRIOR TO LOADING

Volume change (Consolidation), ml	-6.2
Machine Speed, in / min	0.0100
Strain Rate, % / min	0.18
Chamber Pressure, psi	90.0
Back Pressure, psi	80.0
Eff. Consol. Stress, (Minor pr. stress, s ₃), psi	10.0
Change in Height, in	-0.032
"B" Value	0.95

SHEAR DATA

Deformation Stage 2 (inch)	Total Deformation ST.1 + ST.2 (inch)	Axial Load (lb)	Pore-Water Pressure, psi		Strain Stage 2 %	Corrected Area (in ²)	Dev. Stress (Ds=s ₁ -s ₃) (psi)	Major Principal Stress, psi		Effective Stress Ratio s ₁ '/s ₃ '	P' (s ₁ '+s ₃ ')/2 (psi)	Q (s ₁ '-s ₃ ')/2 (psi)	Eff. Minor Pr. Stress s ₃ ' (psi)	Total Strain ST.1 + ST.2 %
			Total, U	Change, DU				Total s ₁	Eff. s ₁					
0.000	0.098	20.3	80.00	0.0	0.00	6.40	0.0	10.0	10.0	1.00	10.0	0.0	10.0	1.76
0.005	0.103	56.9	81.37	1.4	0.09	6.41	5.7	15.7	14.3	1.66	11.5	2.9	8.6	1.85
0.010	0.108	89.5	82.12	2.1	0.18	6.41	10.8	20.8	18.7	2.37	13.3	5.4	7.9	1.94
0.015	0.113	116.6	82.24	2.2	0.27	6.42	15.0	25.0	22.8	2.93	15.3	7.5	7.8	2.03
0.020	0.118	141.3	82.02	2.0	0.37	6.42	18.8	28.8	26.8	3.36	17.4	9.4	8.0	2.12
0.025	0.123	164.3	81.85	1.8	0.46	6.43	22.4	32.4	30.5	3.75	19.3	11.2	8.2	2.21
0.030	0.128	186.3	81.19	1.2	0.55	6.44	25.8	35.8	34.6	3.93	21.7	12.9	8.8	2.30
0.035	0.133	207.2	80.67	0.7	0.64	6.44	29.0	39.0	38.3	4.11	23.8	14.5	9.3	2.39
0.040	0.138	225.7	80.14	0.1	0.73	6.45	31.9	41.9	41.7	4.23	25.8	15.9	9.9	2.48
0.050	0.148	255.0	79.15	-0.8	0.91	6.46	36.3	46.3	47.2	4.35	29.0	18.2	10.9	2.66
0.060	0.158	280.1	78.17	-1.8	1.10	6.47	40.1	50.1	52.0	4.39	31.9	20.1	11.8	2.84
0.070	0.168	302.9	77.16	-2.8	1.28	6.48	43.6	53.6	56.4	4.39	34.6	21.8	12.8	3.02
0.080	0.178	325.7	76.12	-3.9	1.46	6.50	47.0	57.0	60.9	4.39	37.4	23.5	13.9	3.20

Values @ Failure

-2.8	1.28	6.48	43.6	53.6	56.4	4.39	34.6	21.8	12.8	3.02
------	------	------	------	------	------	------	------	------	------	------

 Failure criteria used*

3

 *Note: "1" = Max Deviator Stress; "2" = Deviator Stress @ 15% Strain; "3" = Max Eff. Stress Ratio (s₁'/s₃')



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Web: www.test-llc.com



Tested By: EB/KP
Date: 01/30/21
Checked By:

ASTM D 4767/AASHTO T 297

Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (Multistage per ASTM STP 883)

Client Project #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Laboratory Project #	2104A-05-1
Sample Type	UD
Depth/Elev.	17-19'
Additional Info	-

SPECIMEN PROPERTIES

	(initial)	(after consol.)
Height, in	5.386	5.421
Diameter, in	2.876	2.840
Height-to-Diameter Ratio	1.9	1.9
Area, in ²	6.50	6.33
Volume, cm ³	573.28	562.58
Mass of Wet Sample, g	1113.70	1103.00
Mass of Dry Sample, g	858.31	858.31
Wet Density, pcf	121.3	122.4
Dry Density, pcf	93.5	95.2
Specific Gravity (assumed)	2.700	2.700
Volume of Solids, cm ³	317.89	317.89
Volume of Voids, cm ³	255.39	244.69
Void Ratio	0.80	0.77
% Saturation	100.0	100.0

WATER CONTENT DETERMINATION

	(initial)	(final)
Mass of Wet Sample and Tare, g	1113.70	1384.10
Mass of Dry Sample and Tare, g	858.31	1143.80
Mass of Tare, g	0.00	300.90
Moisture, %	29.76	28.51

TEST DATA PRIOR TO LOADING

Volume change (Consolidation), ml	-10.7
Machine Speed, in / min	0.01000
Strain Rate, % / min	0.18
Chamber Pressure, psi	100.0
Back Pressure, psi	80.0
Eff. Consol. Stress, (Minor pr. stress, s ₃), psi	20.0
Change in Height, in	-0.035
"B" Value	0.95

SHEAR DATA

Deformation Stage 3 (inch)	Total Deformation ST.1 + ST.2 + ST.3 (inch)	Axial Load (lb)	Pore-Water Pressure, psi		Strain Stage 3 %	Corrected Area (in ²)	Deviator Stress (Ds=s ₁ -s ₃) (psi)	Major Principal Stress, psi		Effective Stress Ratio s' ₁ /s' ₃	P' (s' ₁ +s' ₃)/2 (psi)	Q (s ₁ -s ₃)/2 (psi)	Eff. Minor Pr. Stress s' ₃ (psi)	Total Strain ST.1 + ST.2 + ST.3, %
			Total, U	Change, DU				Total s ₁	Eff. s' ₁					
0.000	0.143	29.0	80.00	0.0	0.00	6.33	0.0	20.0	20.0	1.00	20.0	0.0	20.0	2.57
0.010	0.153	145.9	84.01	4.0	0.19	6.34	18.4	38.4	34.4	2.15	25.2	9.2	16.0	2.75
0.020	0.163	234.4	84.50	4.5	0.38	6.36	32.3	52.3	47.8	3.08	31.7	16.2	15.5	2.94
0.031	0.174	307.7	83.55	3.5	0.56	6.37	43.8	63.8	60.2	3.66	38.3	21.9	16.5	3.12
0.041	0.184	367.1	82.24	2.2	0.75	6.38	53.0	73.0	70.7	3.98	44.3	26.5	17.8	3.30
0.051	0.194	411.4	80.87	0.9	0.94	6.39	59.8	79.8	79.0	4.13	49.0	29.9	19.1	3.49
0.071	0.214	476.5	78.13	-1.9	1.32	6.42	69.7	89.7	91.6	4.19	56.7	34.9	21.9	3.85
0.102	0.245	551.6	74.48	-5.5	1.88	6.45	81.0	101.0	106.5	4.17	66.0	40.5	25.5	4.40
0.122	0.265	595.6	72.26	-7.7	2.26	6.48	87.5	107.5	115.2	4.15	71.5	43.7	27.7	4.77
0.153	0.296	655.4	69.19	-10.8	2.82	6.52	96.1	116.1	126.9	4.12	78.9	48.1	30.8	5.32
0.173	0.316	690.5	67.40	-12.6	3.20	6.54	101.1	121.1	133.7	4.10	83.2	50.6	32.6	5.68
0.204	0.347	739.9	64.84	-15.2	3.76	6.58	108.0	128.0	143.2	4.07	89.2	54.0	35.2	6.23
0.234	0.377	784.5	62.58	-17.4	4.32	6.62	114.1	134.1	151.6	4.05	94.5	57.1	37.4	6.78
0.265	0.408	825.9	60.44	-19.6	4.89	6.66	119.7	139.7	159.2	4.03	99.4	59.8	39.6	7.33
0.285	0.428	851.2	59.15	-20.8	5.26	6.68	123.0	143.0	163.8	4.01	102.3	61.5	40.8	7.70
0.316	0.459	888.0	57.30	-22.7	5.83	6.72	127.7	147.7	170.4	3.99	106.6	63.9	42.7	8.25
0.367	0.510	941.8	54.62	-25.4	6.77	6.79	134.4	154.4	179.8	3.96	112.6	67.2	45.4	9.16
0.418	0.561	988.4	52.32	-27.7	7.71	6.86	139.8	159.8	187.5	3.93	117.6	69.9	47.7	10.08
0.479	0.622	1037.9	49.96	-30.0	8.84	6.95	145.2	165.2	195.3	3.90	122.7	72.6	50.0	11.18
0.530	0.673	1076.2	48.21	-31.8	9.78	7.02	149.2	169.2	201.0	3.88	126.4	74.6	51.8	12.09
0.622	0.765	1132.8	45.63	-34.4	11.47	7.15	154.3	174.3	208.7	3.84	131.5	77.2	54.4	13.74
0.683	0.826	1166.2	44.19	-35.8	12.60	7.25	156.9	176.9	212.8	3.81	134.3	78.5	55.8	14.84
0.700	0.843	1173.8	43.83	-36.2	12.91	7.27	157.4	177.4	213.6	3.80	134.9	78.7	56.2	15.15

Values @ Failure

-1.9	1.32	6.42	69.7	89.7	91.6	4.19	56.7	34.9	21.9	3.85
------	------	------	------	------	------	-------------	------	------	------	------

Failure criteria used*

3

*Note: "1" = Max Deviator Stress; "2" = Deviator Stress @ 15% Strain; "3" = Max Eff. Stress Ratio (s'₁/s'₃)



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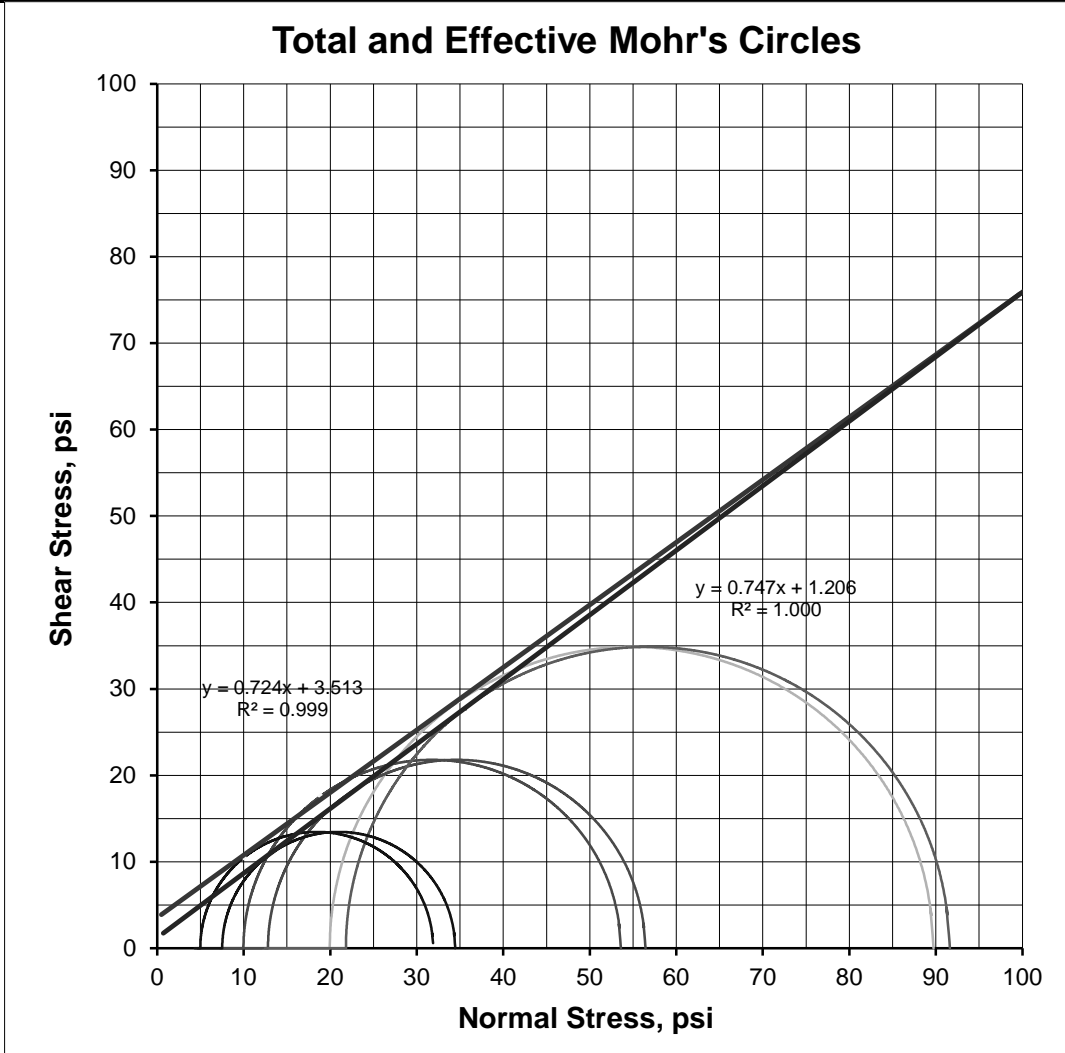
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Date	01/30/21
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ASTM D 4767/AASHTO T 297

Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (Multistage per ASTM STP 883)

Client Project #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Laboratory Project #	2104A-05-1
Sample Type	UD
Depth/Elev.	17-19'
Additional Info	-



	ST. 1	ST. 2	ST. 3
Effective Consolidation Stress, psi	5.0	10.0	20.0
Deviator Stress at Failure, psi	26.9	43.6	69.7
Effective Minor Principal Stress at Failure, psi	7.5	12.8	21.9
Effective Major Principal Stress at Failure, psi	34.5	56.4	91.6
Axial Strain at Failure, %	2.16	1.28	1.32

STRENGTH PARAMETERS*				
	Total		Effective	
f°	35.9		f'°	36.8
C, psi	3.5		C', psi	1.2

*Valid only for Received Material at Reported Densities and Moisture Contents. Please see remarks on page 6 of this report



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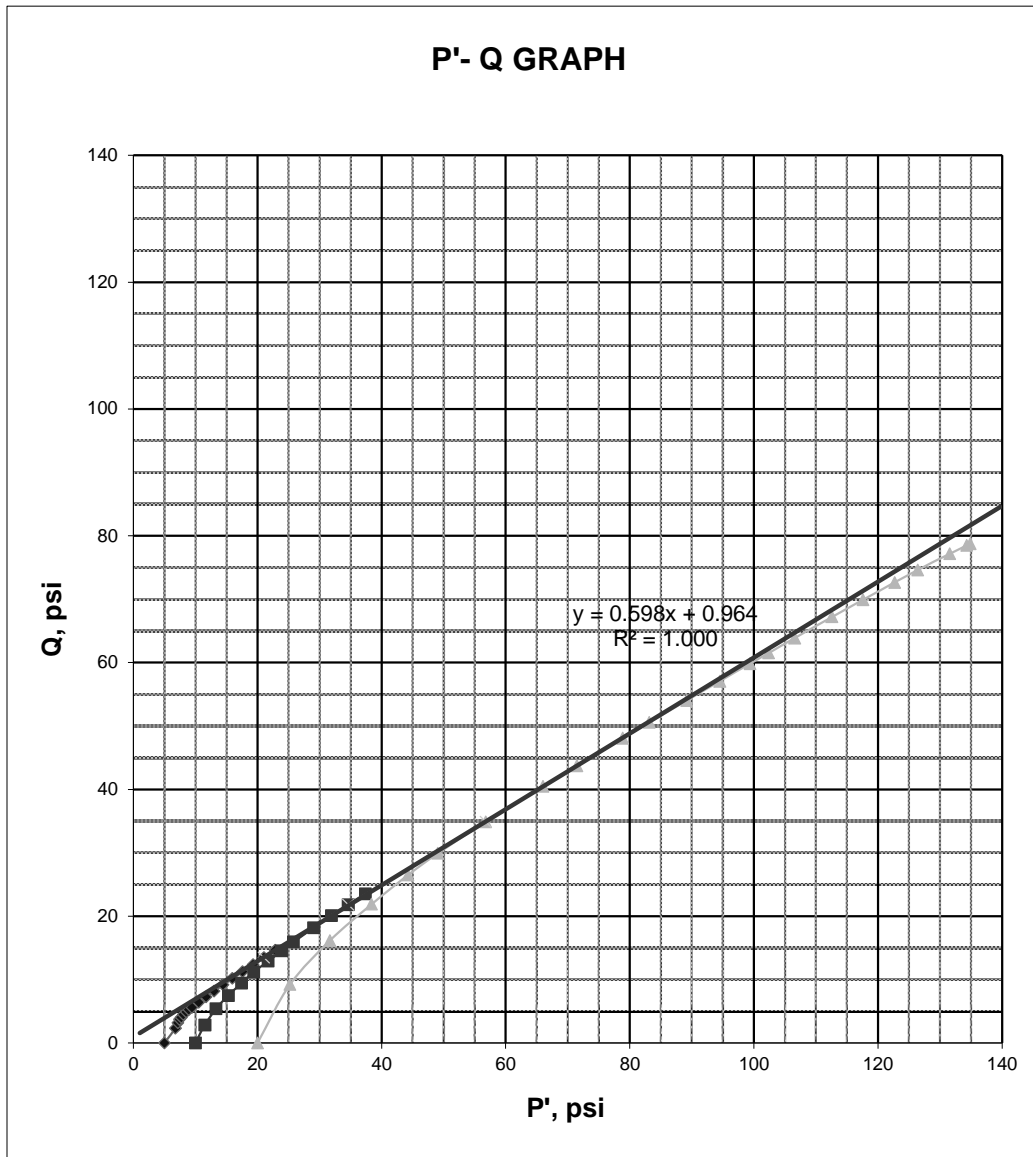
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Date	01/30/21
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ASTM D 4767/AASHTO T 297

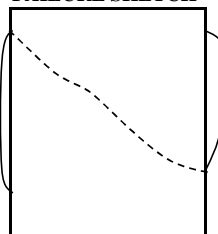
Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (Multistage per ASTM STP 883)

Client Project #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Laboratory Project #	2104A-05-1
Sample Type	UD
Depth/Elev.	17-19'
Additional Info	-



FAILURE SKETCH



a, psi
 a, degree

1.0
30.9



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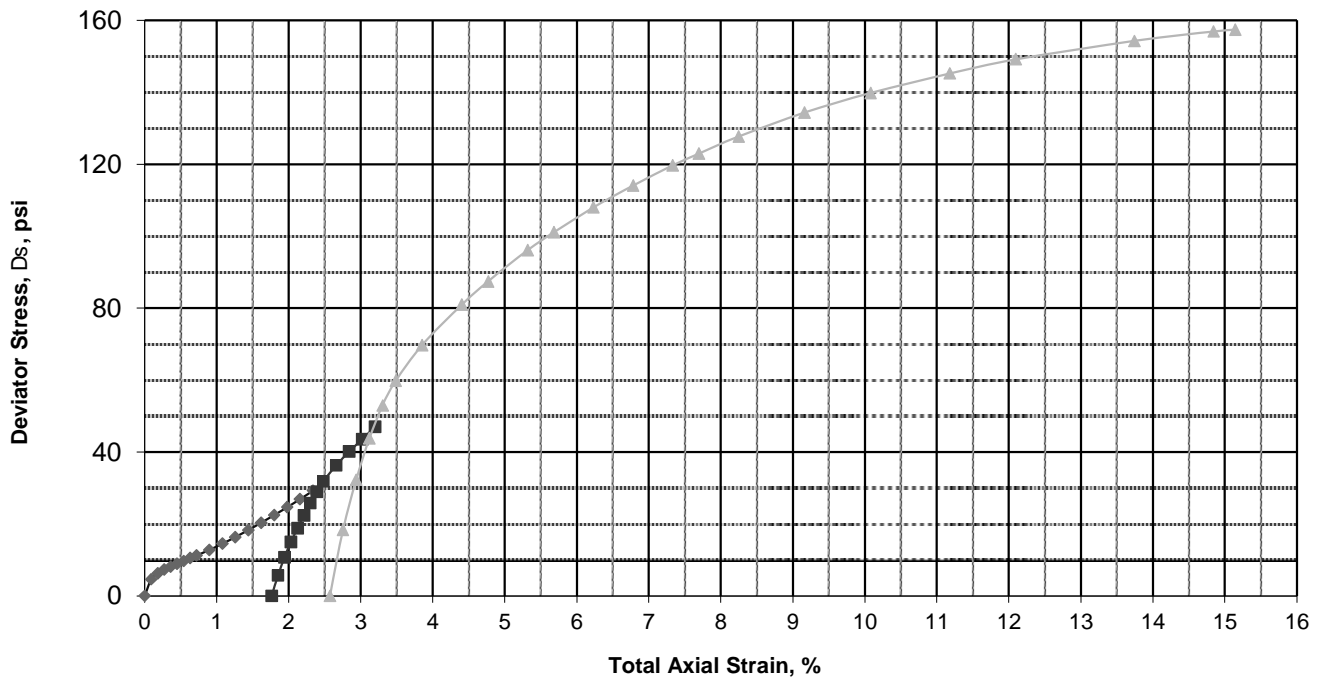
ASTM D 4767/AASHTO T 297

Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (Multistage per ASTM STP 883)

Client Project #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Laboratory Project #	2104A-05-1
Sample Type	UD
Depth/Elev.	17-19'
Additional Info	-

Deviator Stress - Strain Graph



		REMARKS	DESCRIPTION
Balance ID Number	563/700	Material from shelly tube was not homogeneous and/or not long enough to select 3 uniform specimens 6" long each. Most representative portion of sample (4" above the bottom of shelly tube) was selected for multi-stage triaxial testing (per ASTM STP 883).	NA
Oven ID Number	496/610		
Deformation Indicator ID #	178/349/689		
Digital Caliper ID #	370/458		
Load Cell ID #	11/347/692		
Apparatus ID #	10/293/693		

NOTES:

- Method for Saturation
- Method for determination of cross-sectional area after consol.
- Final moisture content (Stage 3) obtained from entire sample

WET
B

LL	-
PL	-
PI	-
Gs	-

USCS (ASTM D2487: D2488)

NA



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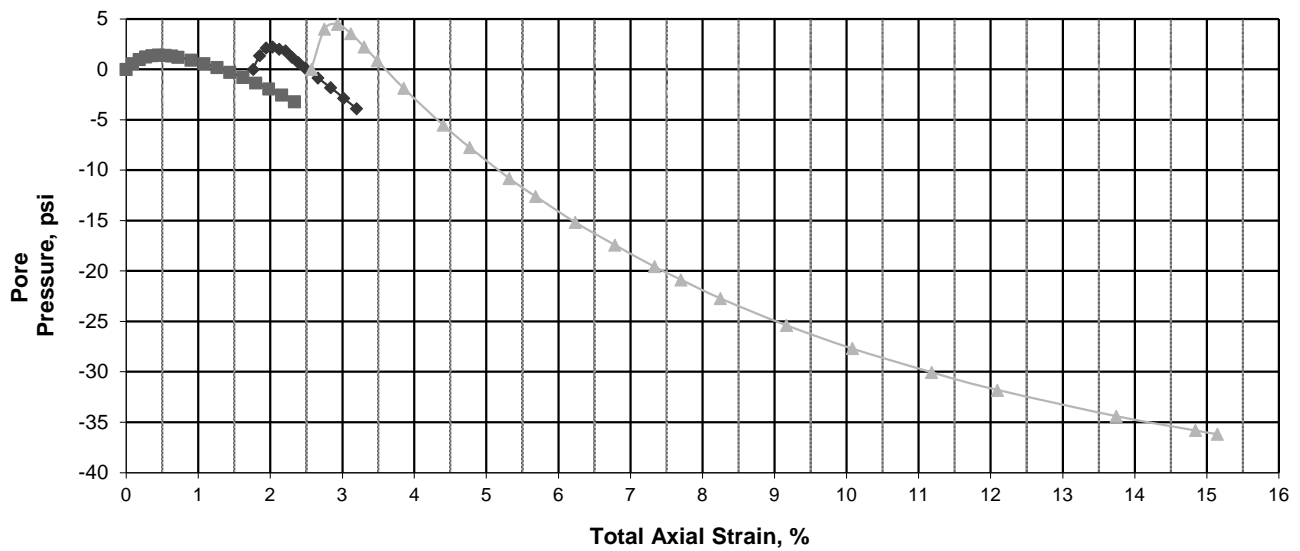
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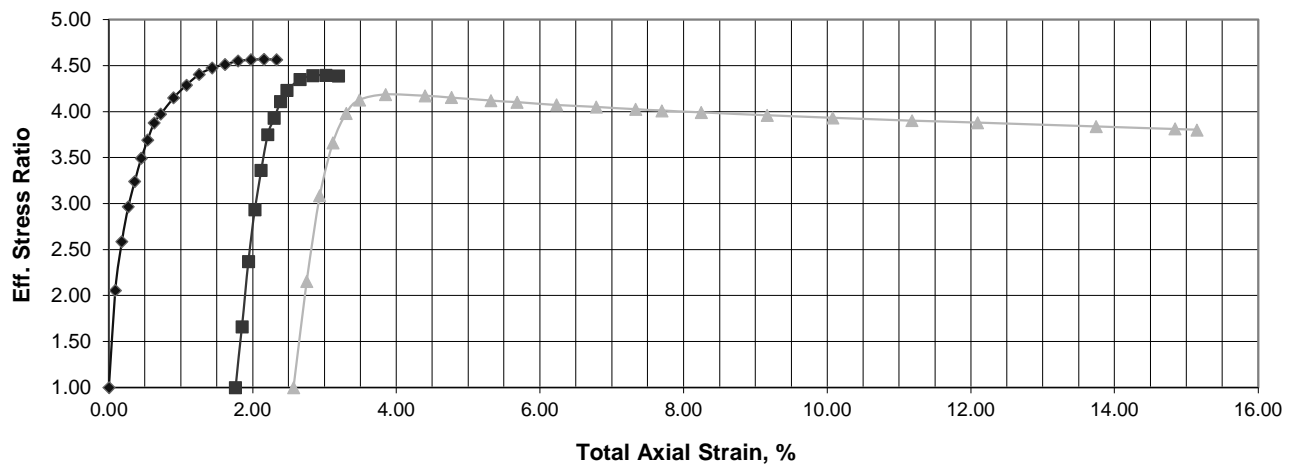
Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (Multistage per ASTM STP 883)

Client Project #	2021003	Laboratory Project #	2104A-05-1
Project Name	James Brown Arena	Sample Type	UD
Sample ID	37082/B-3	Depth/Elev.	17-19'
Location	B-3	Additional Info	-

Pore Pressure - Strain Graph



Effective Stress Ratio-Strain Graph





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Tested By: **KP**
Date: **01/28/21**
Checked By: **[Signature]**

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	17-19'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 2

Pressure* on Specimen, lbf/ft²

250

Selection	4
m ₁	11.29
m ₂	9.81

X	Y
0	13.50
1	23.31

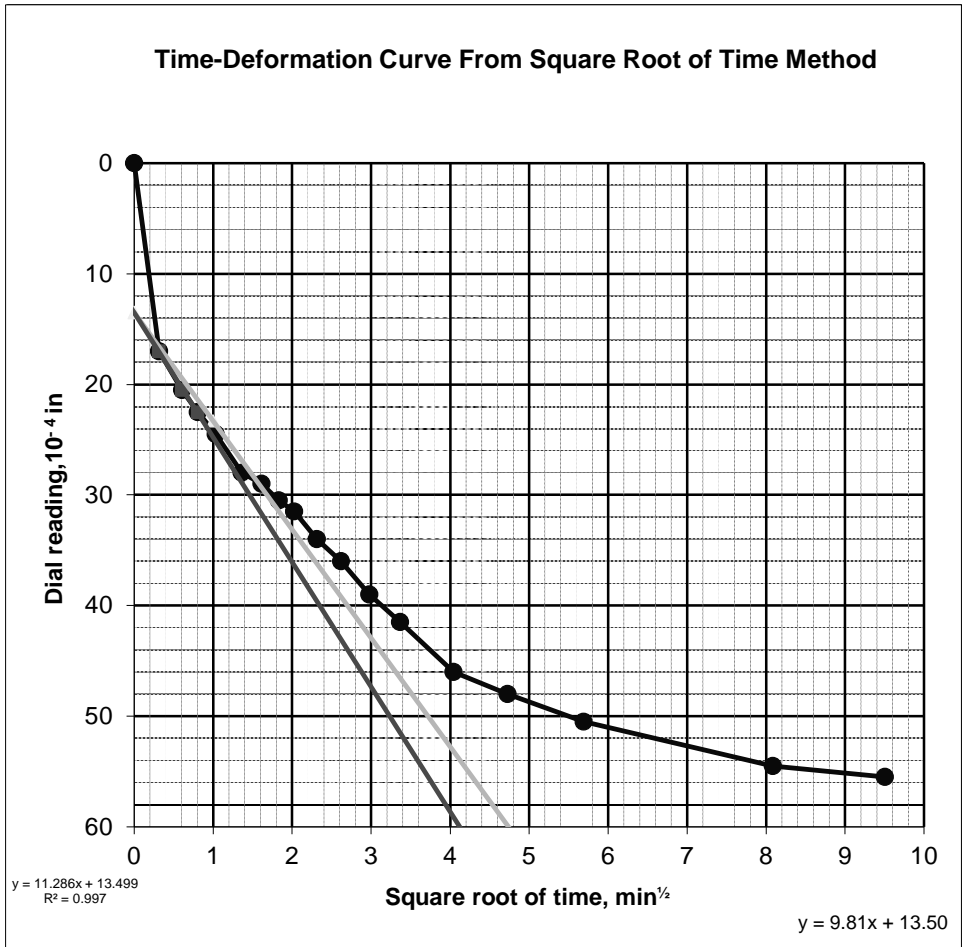
d ₀	13.5
d ₉₀	29
d ₁₀₀	30
d ₅₀	22
sq.root t ₉₀	1.55
t _{90, min}	2.40
sq.root t ₅₀	0.75
t _{50, min}	0.56

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	0.0
2	0.10	0.32	17.0
3	0.37	0.61	20.5
4	0.65	0.81	22.5
5	1.07	1.03	24.5
6	1.85	1.36	28.0
7	2.60	1.61	29.0
8	3.35	1.83	30.5
9	4.10	2.02	31.5
10	5.35	2.31	34.0
11	6.85	2.62	36.0
12	8.9	2.97	39.0
13	11.4	3.37	41.5
14	16.4	4.04	46.0
15	22.4	4.73	48.0
16	32.4	5.69	50.5
17	65.4	8.08	54.5
18	90.4	9.51	55.5
19			
20			

Time-Deformation Curve From Square Root of Time Method





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Date **01/28/21**
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Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	17-19'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 3

Pressure* on Specimen, lbf/ft²

500

Selection	5
m ₁	10.47
m ₂	9.11

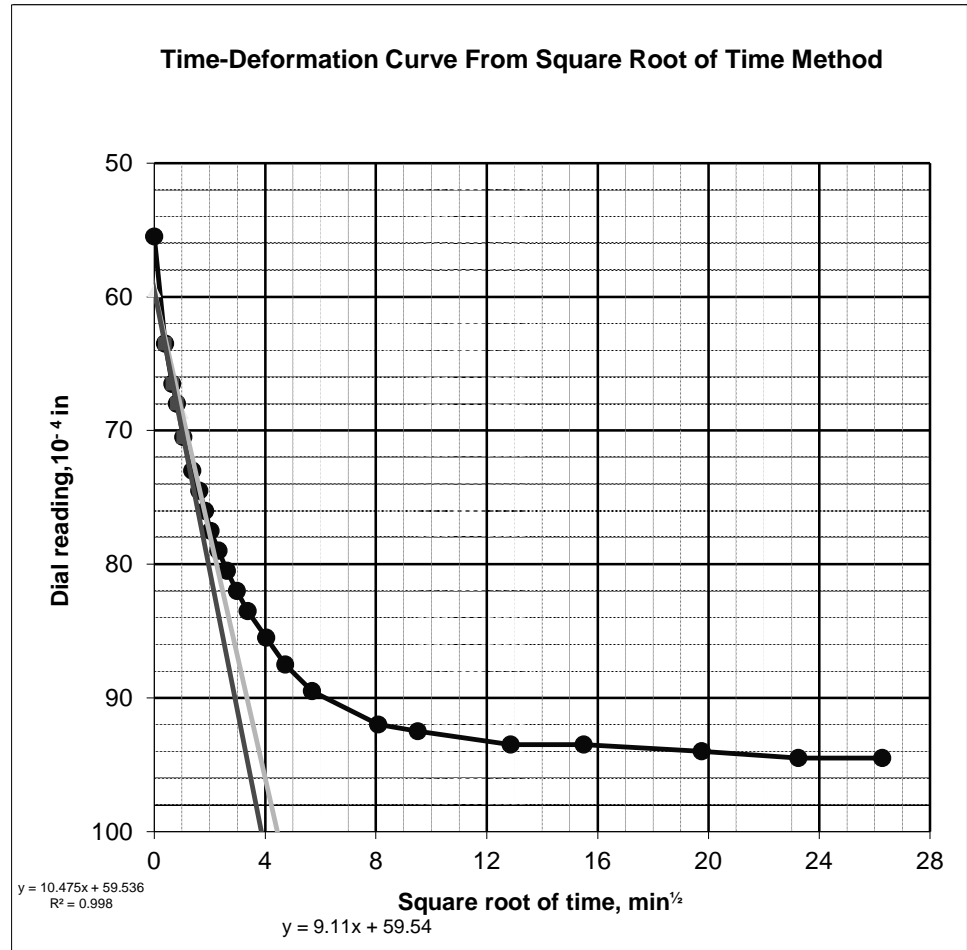
X	Y
0	59.54
1	68.64

d ₀	59.5
d ₉₀	75
d ₁₀₀	77
d ₅₀	68
sq.root t ₉₀	1.7
t _{90, min}	2.89
sq.root t ₅₀	0.82
t _{50, min}	0.67

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	55.5
2	0.15	0.39	63.5
3	0.42	0.65	66.5
4	0.67	0.82	68.0
5	1.10	1.05	70.5
6	1.88	1.37	73.0
7	2.63	1.62	74.5
8	3.38	1.84	76.0
9	4.13	2.03	77.5
10	5.38	2.32	79.0
11	6.88	2.62	80.5
12	8.9	2.98	82.0
13	11.4	3.37	83.5
14	16.4	4.05	85.5
15	22.4	4.73	87.5
16	32.4	5.69	89.5
17	65.4	8.09	92.0
18	90.4	9.51	92.5
19	165.4	12.86	93.5
20	240.4	15.50	93.5
	390.4	19.76	94.0
	540.4	23.25	94.5
	690.4	26.28	94.5





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Date: **01/29/21**
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Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	17-19'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 4

Pressure* on Specimen, lbf/ft²

1000

Selection	10
m ₁	11.27
m ₂	9.80

X	Y
0	111.97
1	121.78

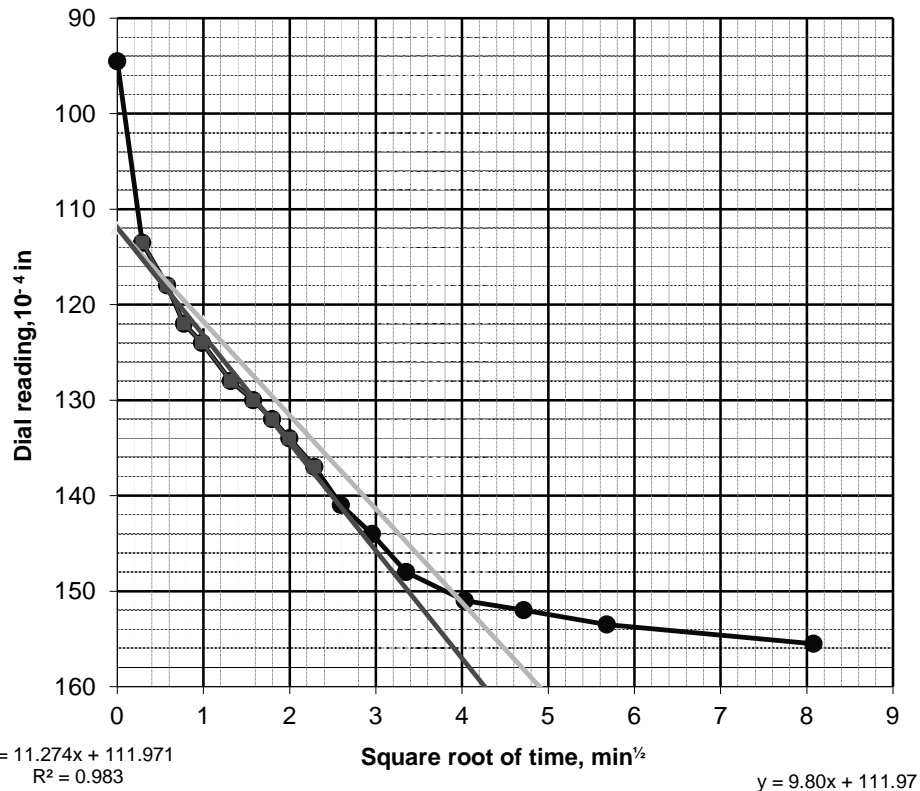
d ₀	112.0
d ₉₀	150
d ₁₀₀	154
d ₅₀	133
sq.root t ₉₀	3.9
t _{90, min}	15.21
sq.root t ₅₀	1.88
t _{50, min}	3.55

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	94.5
2	0.08	0.29	113.5
3	0.33	0.58	118.0
4	0.60	0.77	122.0
5	0.97	0.98	124.0
6	1.73	1.32	128.0
7	2.48	1.58	130.0
8	3.23	1.80	132.0
9	3.98	2.00	134.0
10	5.23	2.29	137.0
11	6.73	2.59	141.0
12	8.7	2.96	144.0
13	11.2	3.35	148.0
14	16.2	4.03	151.0
15	22.2	4.72	152.0
16	32.2	5.68	153.5
17	65.2	8.08	155.5
18			
19			
20			

Time-Deformation Curve From Square Root of Time Method





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Tested By: **KP**
Date: **01/29/21**
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Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	17-19'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 5

Pressure* on Specimen, lbf/ft²

250

Selection	3
m ₁	-1.73
m ₂	-1.50

X	Y
0	153.55
1	152.04

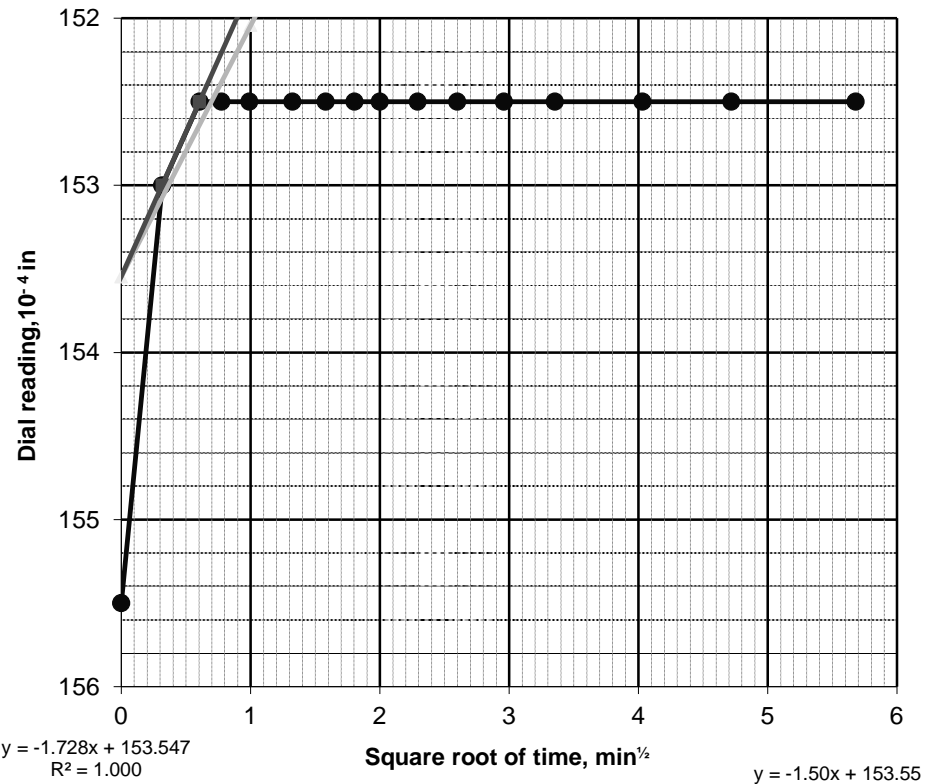
d ₀	153.5
d ₉₀	152
d ₁₀₀	152
d ₅₀	153
sq.root t ₉₀	0.7
t ₉₀ , min	0.49
sq.root t ₅₀	0.34
t ₅₀ , min	0.11

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	155.5
2	0.10	0.32	153.0
3	0.37	0.61	152.5
4	0.60	0.77	152.5
5	0.98	0.99	152.5
6	1.75	1.32	152.5
7	2.50	1.58	152.5
8	3.25	1.80	152.5
9	4.00	2.00	152.5
10	5.25	2.29	152.5
11	6.75	2.60	152.5
12	8.8	2.96	152.5
13	11.3	3.35	152.5
14	16.3	4.03	152.5
15	22.3	4.72	152.5
16	32.3	5.68	152.5
17			
18			
19			
20			

Time-Deformation Curve From Square Root of Time Method





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Tested By **KP**
Date **01/29/21**
Checked By **[Signature]**

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	17-19'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 6

Pressure* on Specimen, lbf/ft²

500

Selection	3
m ₁	1.97
m ₂	1.71

X	Y
0	156.28
1	157.99

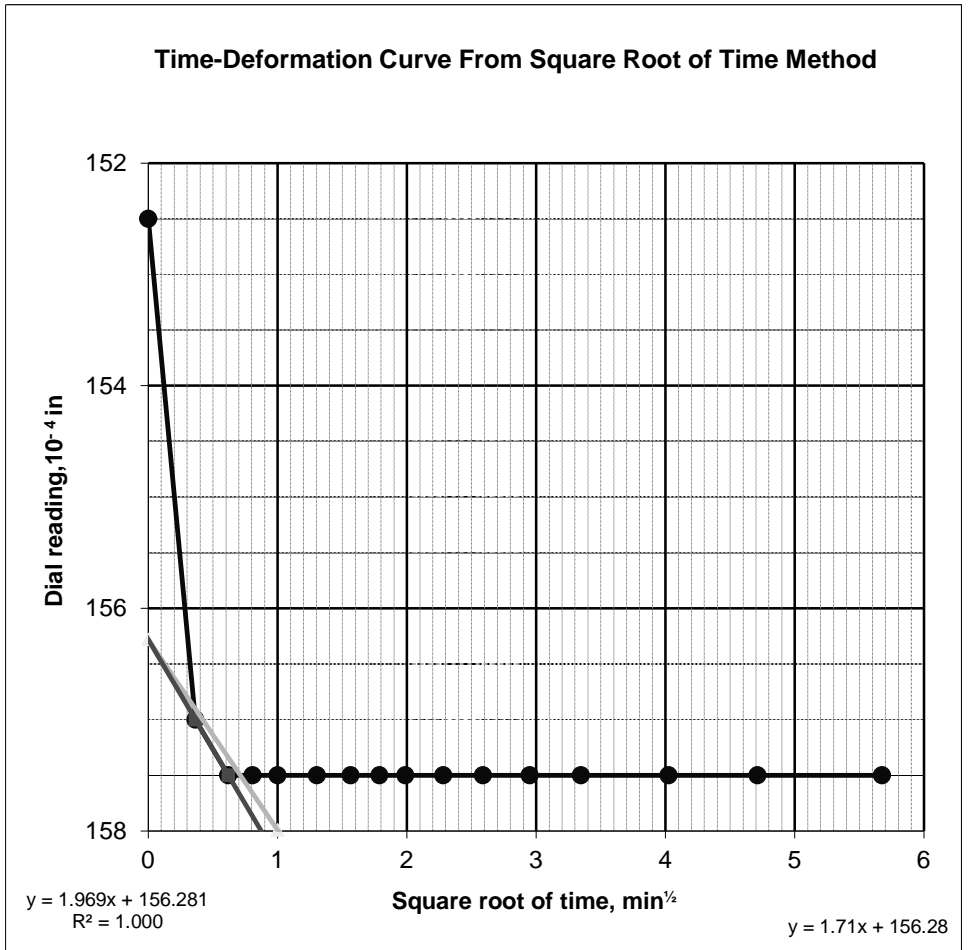
d ₀	156.3
d ₉₀	157
d ₁₀₀	158
d ₅₀	157
sq.root t ₉₀	0.7
t ₉₀ , min	0.49
sq.root t ₅₀	0.34
t ₅₀ , min	0.11

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	152.5
2	0.13	0.37	157.0
3	0.38	0.62	157.5
4	0.65	0.81	157.5
5	1.00	1.00	157.5
6	1.70	1.30	157.5
7	2.45	1.57	157.5
8	3.20	1.79	157.5
9	3.95	1.99	157.5
10	5.20	2.28	157.5
11	6.70	2.59	157.5
12	8.7	2.95	157.5
13	11.2	3.35	157.5
14	16.2	4.02	157.5
15	22.2	4.71	157.5
16	32.2	5.67	157.5
17			
18			
19			
20			

Time-Deformation Curve From Square Root of Time Method





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TESTS, LLC**

1874 Forge Street Tucker, GA 30084

Ph: 770-938-8233

Fax: 770-923-8973

Web: www.test-llc.com



Tested By: **KP**
Date: **01/29/21**
Checked By: **[Signature]**

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	17-19'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 7

Pressure* on Specimen, lbf/ft²

1000

Selection	5
m ₁	2.72
m ₂	2.36

X	Y
0	160.29
1	162.65

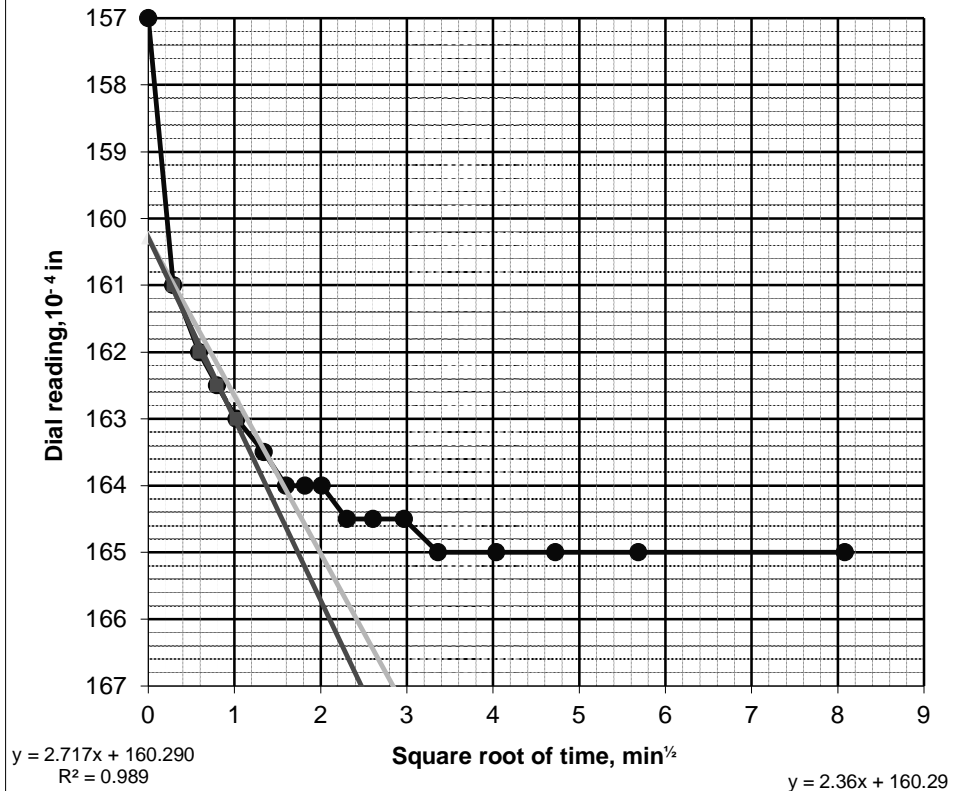
d ₀	160.3
d ₉₀	164
d ₁₀₀	164
d ₅₀	162
sq.root t ₉₀	1.6
t _{90, min}	2.56
sq.root t ₅₀	0.77
t _{50, min}	0.60

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	157.0
2	0.08	0.29	161.0
3	0.35	0.59	162.0
4	0.63	0.80	162.5
5	1.05	1.02	163.0
6	1.80	1.34	163.5
7	2.55	1.60	164.0
8	3.30	1.82	164.0
9	4.05	2.01	164.0
10	5.30	2.30	164.5
11	6.80	2.61	164.5
12	8.8	2.97	164.5
13	11.3	3.36	165.0
14	16.3	4.04	165.0
15	22.3	4.72	165.0
16	32.3	5.68	165.0
17	65.3	8.08	165.0
18			
19			
20			

Time-Deformation Curve From Square Root of Time Method





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Tested By **KP**
Date **01/29/21**
Checked By **KB**

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	17-19'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 8

Pressure* on Specimen, lbf/ft²

2000

Selection	6
m ₁	17.88
m ₂	15.54

X	Y
0	198.33
1	213.88

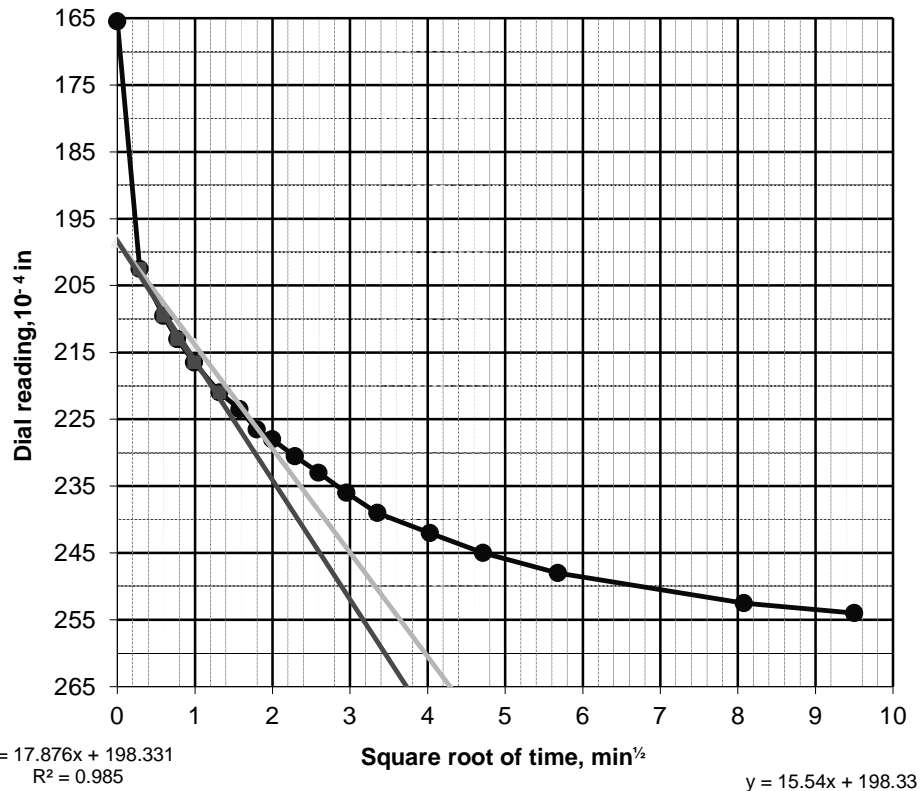
d ₀	198.3
d ₉₀	226
d ₁₀₀	229
d ₅₀	214
sq.root t ₉₀	1.8
t _{90, min}	3.24
sq.root t ₅₀	0.87
t _{50, min}	0.76

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	165.5
2	0.08	0.29	202.5
3	0.35	0.59	209.5
4	0.60	0.77	213.0
5	0.98	0.99	216.5
6	1.73	1.32	221.0
7	2.48	1.58	223.5
8	3.23	1.80	226.5
9	3.98	2.00	228.0
10	5.23	2.29	230.5
11	6.73	2.59	233.0
12	8.7	2.96	236.0
13	11.2	3.35	239.0
14	16.2	4.03	242.0
15	22.2	4.72	245.0
16	32.2	5.68	248.0
17	65.2	8.08	252.5
18	90.2	9.50	254.0
19			
20			

Time-Deformation Curve From Square Root of Time Method





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Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	17-19'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 9

Pressure* on Specimen, lbf/ft²

4000

Selection	7
m ₁	26.54
m ₂	23.08

X	Y
0	314.73
1	337.80

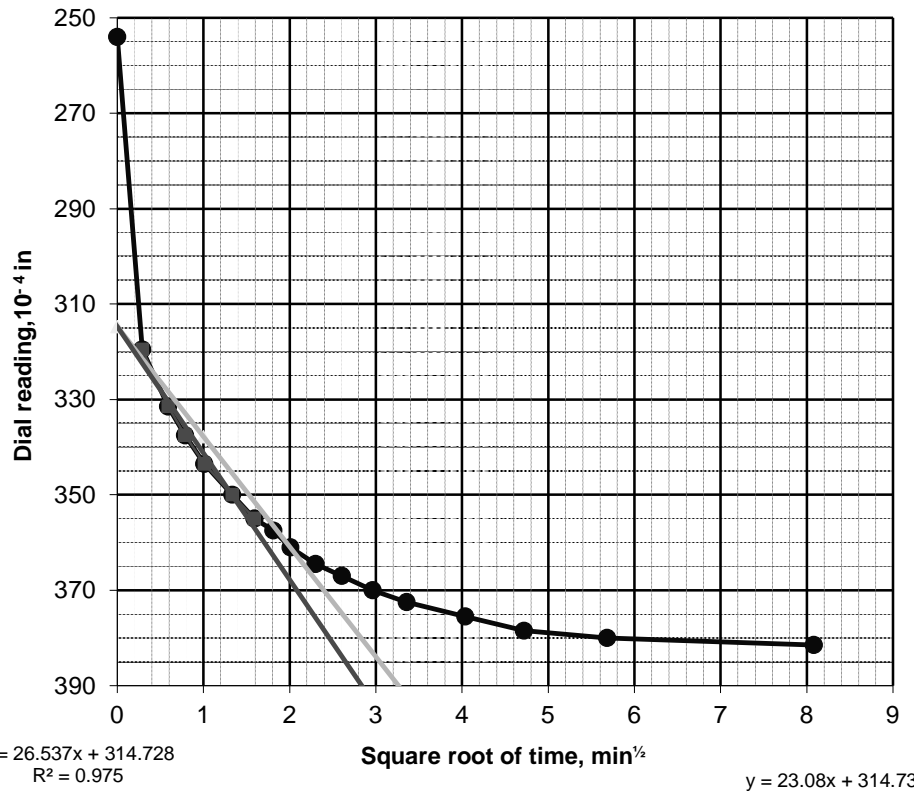
d ₀	314.7
d ₉₀	361
d ₁₀₀	366
d ₅₀	340
sq.root t ₉₀	2
t ₉₀ , min	4.00
sq.root t ₅₀	0.97
t ₅₀ , min	0.93

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	254.0
2	0.08	0.29	319.5
3	0.35	0.59	331.5
4	0.62	0.79	337.5
5	1.02	1.01	343.5
6	1.78	1.34	350.0
7	2.53	1.59	355.0
8	3.28	1.81	357.5
9	4.03	2.01	361.0
10	5.28	2.30	364.5
11	6.78	2.60	367.0
12	8.8	2.96	370.0
13	11.3	3.36	372.5
14	16.3	4.04	375.5
15	22.3	4.72	378.5
16	32.3	5.68	380.0
17	65.3	8.08	381.5
18			
19			
20			

Time-Deformation Curve From Square Root of Time Method





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Date **01/29/21**
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Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37082/B-3
Location	B-3

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	17-19'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 10

Pressure* on Specimen, lbf/ft²

8000

Selection	9
m ₁	25.53
m ₂	22.20

X	Y
0	463.87
1	486.07

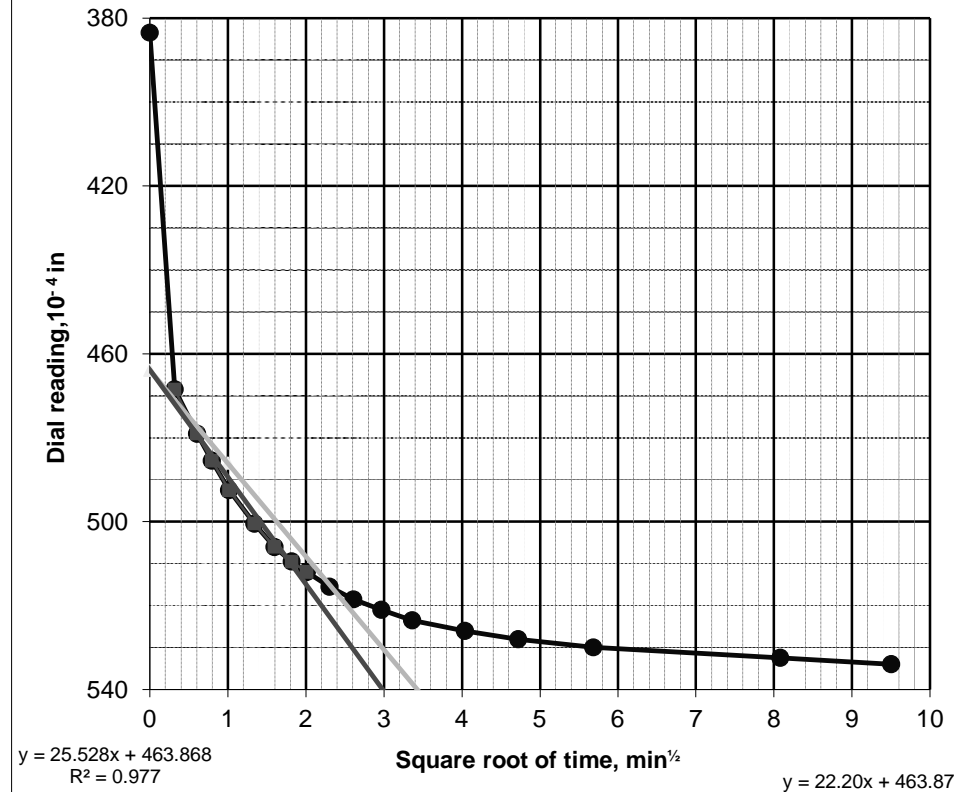
d ₀	463.9
d ₉₀	515
d ₁₀₀	521
d ₅₀	492
sq.root t ₉₀	2.3
t _{90, min}	5.29
sq.root t ₅₀	1.11
t _{50, min}	1.23

d=dial gauge reading, 10⁻⁴ in

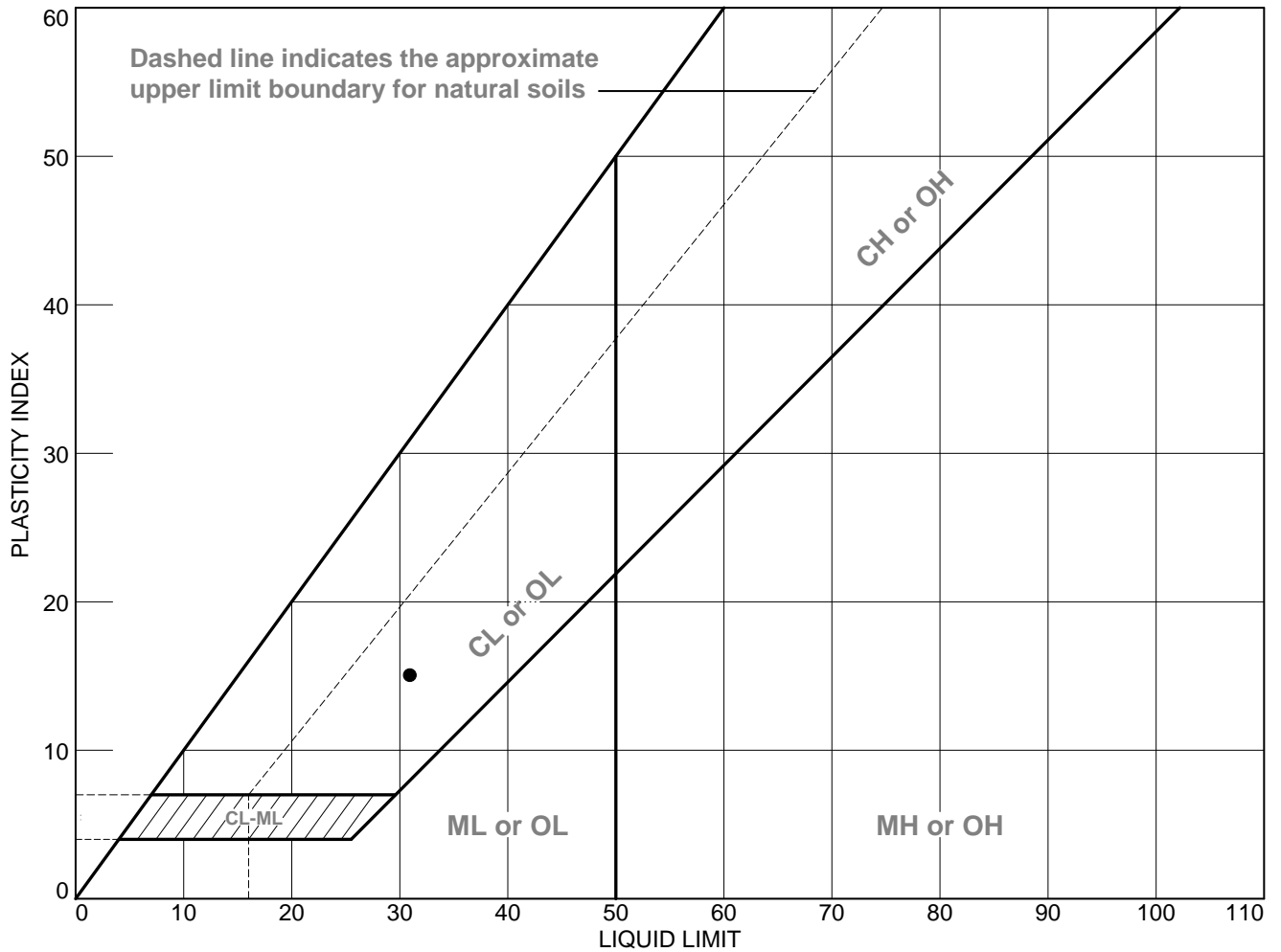
Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	383.5
2	0.10	0.32	468.5
3	0.37	0.61	479.0
4	0.63	0.80	485.5
5	1.03	1.02	492.5
6	1.80	1.34	500.5
7	2.55	1.60	506.0
8	3.30	1.82	509.5
9	4.05	2.01	512.0
10	5.30	2.30	515.5
11	6.80	2.61	518.5
12	8.8	2.97	521.0
13	11.3	3.36	523.5
14	16.3	4.04	526.0
15	22.3	4.72	528.0
16	32.3	5.68	530.0
17	65.3	8.08	532.5
18	90.3	9.50	534.0
19			
20			

Time-Deformation Curve From Square Root of Time Method



LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-4	4	8.5-10 Ft	20.7	16	31	15	

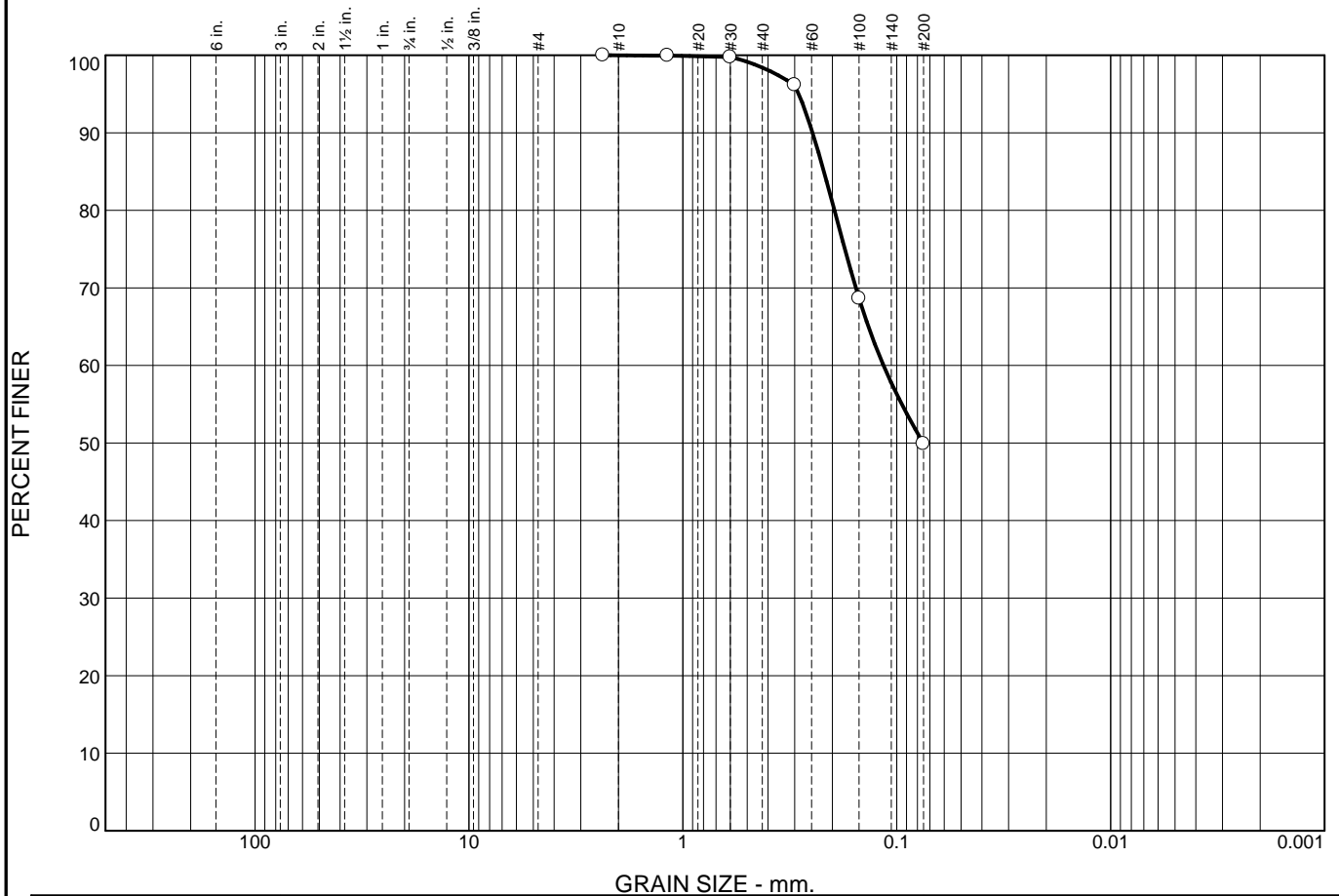
**Nova Engineering
& Environmental
Norcross, GA**

Client: H.J. Russell & Company
Project: James Brown Arena

Project No.: 2021003

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0.0	0.0	0.0	0.0	1.6	48.5	49.9			
×	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○			0.2190	0.1153	0.0753					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○			

Project No. 2021003 **Client:** H.J. Russell & Company
Project: James Brown Arena
 ○ **Source of Sample:** B-6 **Depth:** 13.5-15 Ft **Sample Number:** SA-1

Nova Engineering & Environmental
Norcross, GA

Remarks:
 ○ Boring 6, Sample 5

Figure



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Tested By	KP
Date	01/28/21
Checked By	<i>16</i>

Client Pr. #	2021003	Lab. PR. #	2104A-05-1
Project Name	James Brown Arena	S. Type	UD
Sample ID	37083/B-4	Depth/Elev.	15-17'
Location	B-4	Add. Info	-

ASTM D2435

Standard Test Method for One-Dimensional Consolidation Properties of Soils (Method B)

Sample Data

	Initial	Final		
Mass of Ring, g	194.02	194.02	Initial Seating Pressure, lbf/ft ²	100
Mass of Wet Sample and Ring, g	345.36	344.85	Additional Vertical Pressure, lbf/ft ²	0
Mass of Wet Sample, g	151.34	150.83	Total Seating Pressure, lbf/ft ²	100
Mass of Dry Sample, g	122.49	122.49	STATION #	2
Height of Sample, in	0.9980	0.9397	Consolidometer Ring ID Number	2
Diameter of Sample, in	2.515	2.515	Consolidometer ID Number	2
Area of Sample, in ²	4.97	4.97	Frame ID Number	66
Volume of Sample, in ³	4.96	4.67	Dial Gage ID Number	677
Specific Gravity (Assumed)	2.700	2.700		
Wet Unit Weight, pcf	116.3	123.1	Initial Dial Gauge Reading, 10 ⁻⁴ in	0
Dry Unit Weight, pcf	94.1	100.0	Final Dial Gauge Reading, 10 ⁻⁴ in	583
Height of Solids, in	0.5573	0.5573		
Height of Voids, in	0.4407	0.3824		
Height of Water, in	0.3544	0.3481		
Void Ratio	0.791	0.686		
Degree of Saturation, %	80.4	91.0		

DESCRIPTION

NA

USCS (ASTM D2487;2488)

NA

REMARKS

Portion of sample used for testing was located 19" above the bottom of the Shelby tube.

Moisture Content

	Trimmings	Initial	Final		
Mass of Wet Sample and Tare, g	660.30	345.36	434.22	LL	-
Mass of Dry Sample and Tare, g	552.50	316.51	405.88	PL	-
Mass of Tare, g	101.40	194.02	283.40	PI	-
Moisture Content, %	23.9	23.6	23.1		



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Tested By **KP**
Date **01/28/21**
Checked By **[Signature]**

Client Pr. #	2021003	Lab Pr. #	2104A-05-1
Project Name	James Brown Arena	S. Type	UD
Sample ID	37083/B-4	Depth/Elev.	15-17'
Location	B-4	Add. Info	-

ASTM D2435

Standard Test Method for One-Dimensional Consolidation Properties of Soils (Method B)

Void Ratio, Strain Information and Coefficient of Consolidation Calculation

Pressure		Uncorrected Dial Reading, in		Apparatus Correction, in	Corrected Dial Reading, in		Change in specimen height, in		Sample Height, in		Height of Voids, in	Void Ratio		Strain, %		Fitting Time, min		Hd ₅₀ , in	Coefficient of Consolidation			
lbf/ft ²	Ksf	d ₁₀₀	d ₅₀		d ₁₀₀	d ₅₀	SD H ₁₀₀	SD H ₅₀	H ₁₀₀	H ₅₀	Hv ¹⁰⁰ , in	e ₁₀₀	e ₅₀	e ₁₀₀	e ₅₀	t ₉₀	t ₅₀		in ² /min	ft ² /day		
100	0.1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9980	0.9980	0.4407	0.791	0.791	0.00	0.00	-	-	0.4990	-	-		
250	0.25	0.0020	0.0018	0.0000	0.0020	0.0018	0.0020	0.0018	0.9960	0.9962	0.4387	0.787	0.788	0.20	0.18	1.21	0.28	0.4981	0.17	1.74		
500	0.5	0.0049	0.0045	0.0000	0.0049	0.0045	0.0049	0.0045	0.9931	0.9935	0.4358	0.782	0.783	0.49	0.45	1.69	0.39	0.4967	0.12	1.24		
1000	1	0.0098	0.0093	0.0000	0.0098	0.0093	0.0098	0.0093	0.9882	0.9887	0.4309	0.773	0.774	0.98	0.93	2.25	0.53	0.4944	0.09	0.92		
250	0.25	0.0092	0.0093	0.0000	0.0092	0.0093	0.0092	0.0093	0.9888	0.9887	0.4316	0.774	0.774	0.92	0.93	0.49	0.11	0.4943	0.42	4.23		
500	0.5	0.0095	0.0094	0.0000	0.0095	0.0094	0.0095	0.0094	0.9885	0.9886	0.4312	0.774	0.774	0.95	0.94	0.72	0.17	0.4943	0.29	2.87		
1000	1	0.0108	0.0106	0.0000	0.0108	0.0106	0.0108	0.0106	0.9872	0.9874	0.4299	0.772	0.772	1.08	1.06	1.82	0.43	0.4937	0.11	1.13		
2000	2	0.0183	0.0174	0.0000	0.0183	0.0174	0.0183	0.0174	0.9797	0.9806	0.4224	0.758	0.760	1.84	1.75	2.40	0.56	0.4903	0.08	0.85		
4000	4	0.0328	0.0311	0.0000	0.0328	0.0311	0.0328	0.0311	0.9652	0.9669	0.4080	0.732	0.735	3.28	3.11	3.42	0.80	0.4835	0.06	0.58		
8000	8	0.0583	0.0553	0.0000	0.0583	0.0553	0.0583	0.0553	0.9397	0.9427	0.3824	0.686	0.692	5.84	5.54	4.41	1.03	0.4713	0.04	0.43		

Note: d₁₀₀ = Dial gauge reading at 100% primary consolidation, in
 d₅₀ = Dial gauge reading at 50% primary consolidation, in
 H₁₀₀ = Specimen height at 100% primary consolidation, in
 H₅₀ = Specimen height at 50% primary consolidation, in
 Hd₅₀ = Length of the drainage path at 50% consolidation, in
 e₁₀₀ = Void ratio at 100% primary consolidation
 e₅₀ = Void ratio at 50% primary consolidation



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Tested By KP

Date 01/28/21

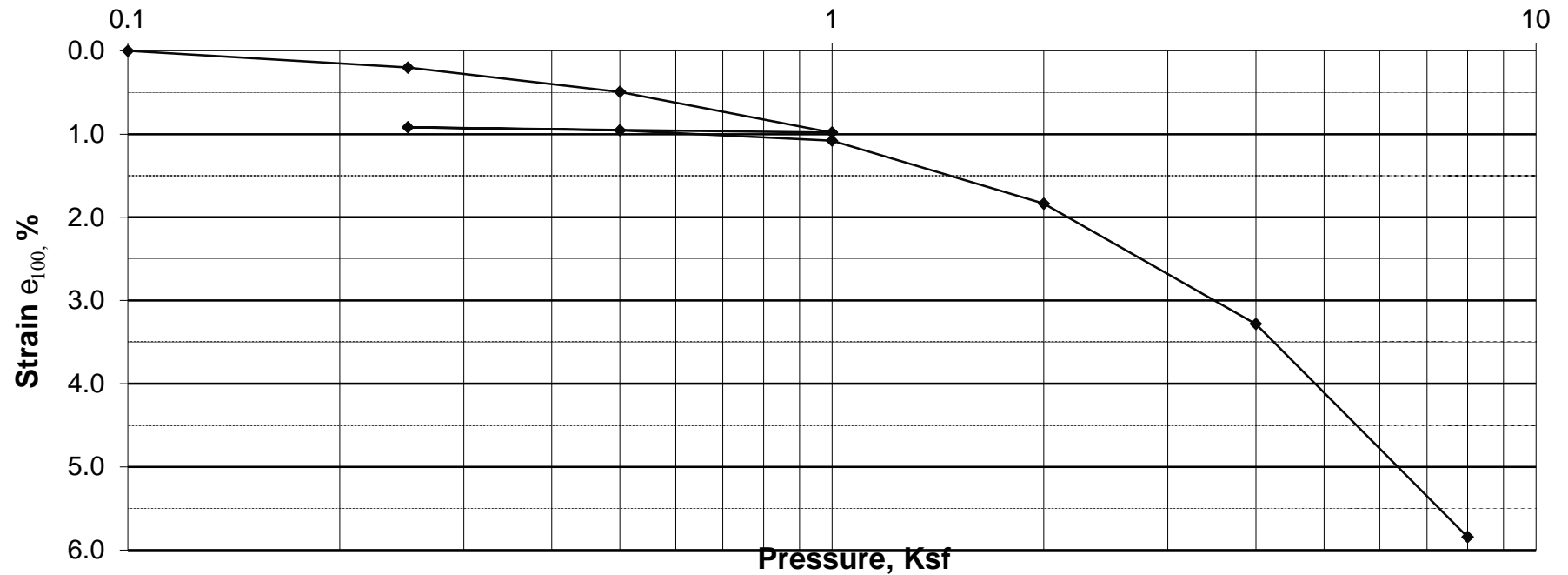
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Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	15-17'
Add. Info	-

ASTM D 2435; Standard Test Method for One-Dimensional Consolidation Properties of Soils (Method B)

Strain at the End-of-Primary Consolidation vs. Log of Pressure





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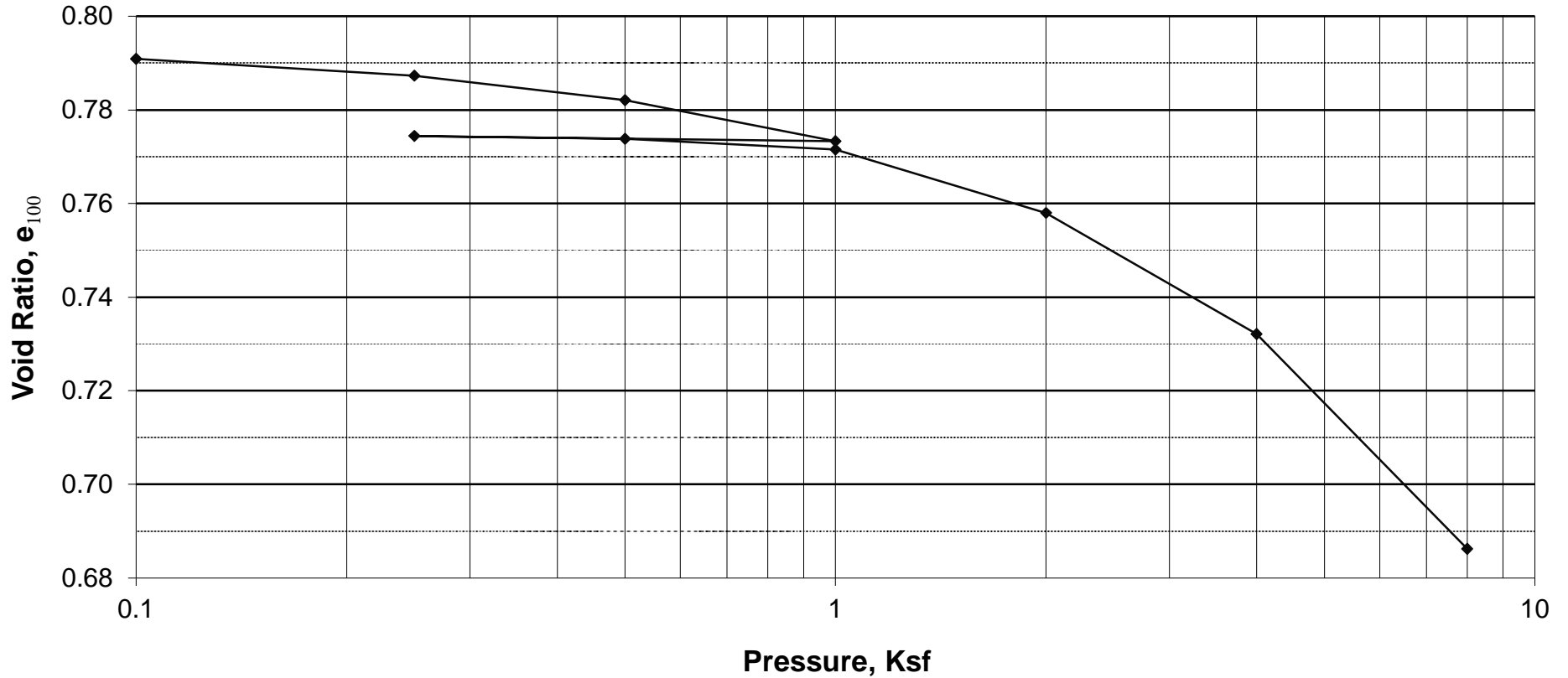
Tested By	KP
Date	01/28/21
Checked By	<i>IB</i>

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	15-17'
Add. Info	-

ASTM D 2435; Standard Test Method for One-Dimensional Consolidation Properties of Soils (Method B)

Void Ratio vs. Log of Pressure





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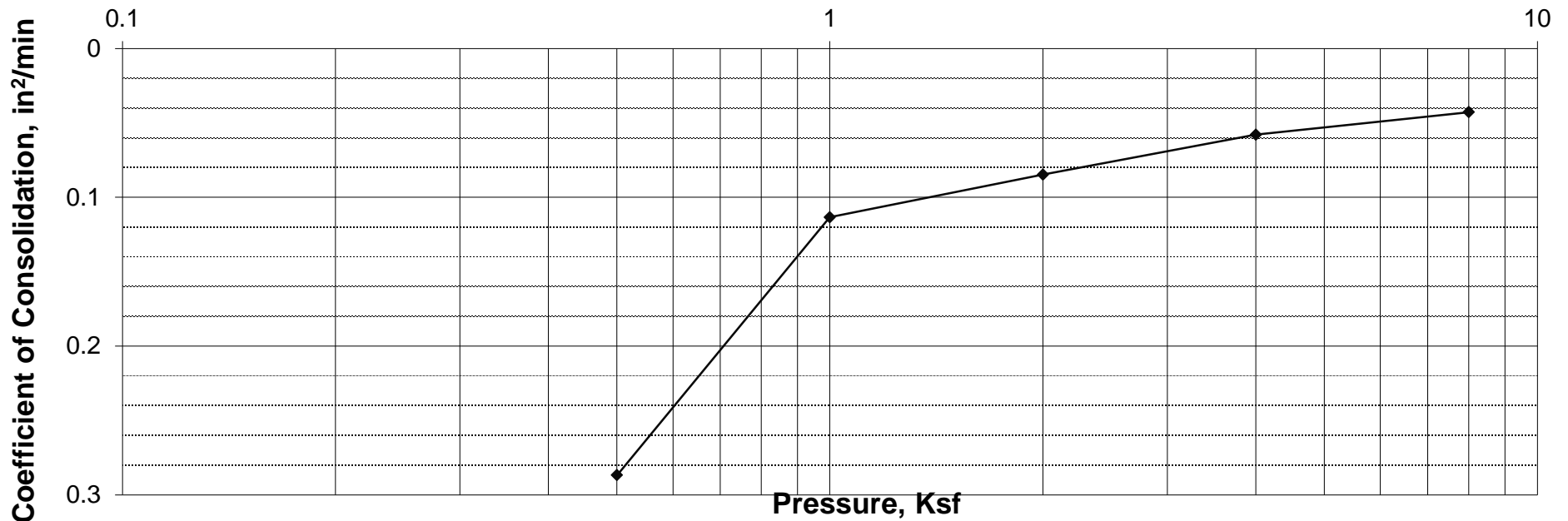
Tested By	KP
Date	01/28/21
Checked By	<i>[Signature]</i>

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	15-17'
Add. Info	-

ASTM D 2435; Standard Test Method for One-Dimensional Consolidation Properties of Soils (Method B)

Coefficient of Consolidation vs. Log of Pressure





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Tested By: EB/KP
 Date: 01/29/21
 Checked By: *[Signature]*

ASTM D 4767/AASHTO T 297

Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (Multistage per ASTM STP 883)

Client Project #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Laboratory Project #	2104A-05-1
Sample Type	UD
Depth/Elev.	15-17'
Additional Info	-

SPECIMEN PROPERTIES

	(initial)	(after consol.)
Height, in	5.708	5.702
Diameter, in	2.875	2.863
Height-to-Diameter Ratio	2.0	2.0
Area, in ²	6.49	6.44
Volume, cm ³	607.23	601.38
Mass of Wet Sample, g	1211.10	1218.00
Mass of Dry Sample, g	979.35	979.35
Wet Density, pcf	124.5	126.4
Dry Density, pcf	100.7	101.7
Specific Gravity (assumed)	2.700	2.700
Volume of Solids, cm ³	362.72	362.72
Volume of Voids, cm ³	244.51	238.65
Void Ratio	0.67	0.66
% Saturation	94.8	100.0

WATER CONTENT DETERMINATION

	(initial)	(final)
Mass of Wet Sample and Tare, g	1211.10	1218.00
Mass of Dry Sample and Tare, g	979.35	979.35
Mass of Tare, g	0.00	0.00
Moisture, %	23.66	24.37

TEST DATA PRIOR TO LOADING

Volume change (Consolidation), ml	6.9
Machine Speed, in / min	0.0100
Strain Rate, % / min	0.18
Chamber Pressure, psi	85.0
Back Pressure, psi	80.0
Eff. Consol. Stress, (Minor pr. stress, s ₃), psi	5.0
Change in Height, in	0.006
"B" Value	0.95

SHEAR DATA

Elapsed Time (min)	Deformation Stage 1 (inch)	Axial Load (lb)	Pore-Water Pressure, psi		Total Strain Stage 1 (%)	Corrected Area (in ²)	Dev. Stress (Ds=s ₁ -s ₃) (psi)	Major Principal Stress, psi		Eff. Stress Ratio s' ₁ /s' ₃	P' (s' ₁ +s' ₃)/2 (psi)	Q (s ₁ -s ₃)/2 (psi)	Eff. Minor Pr. Stress s' ₃ (psi)
			Total, U	Change, DU				Total s ₁	Eff. s' ₁				
0.0	0.000	18.2	80.00	0.0	0.00	6.44	0.0	5.0	5.0	1.00	5.0	0.0	5.0
0.5	0.005	34.4	80.82	0.8	0.09	6.44	2.5	7.5	6.7	1.60	5.4	1.3	4.2
1.0	0.010	43.0	81.39	1.4	0.18	6.45	3.8	8.8	7.5	2.07	5.5	1.9	3.6
1.5	0.015	49.0	81.68	1.7	0.26	6.45	4.8	9.8	8.1	2.44	5.7	2.4	3.3
2.0	0.020	53.6	81.80	1.8	0.35	6.46	5.5	10.5	8.7	2.71	5.9	2.7	3.2
2.5	0.025	57.6	81.85	1.8	0.44	6.46	6.1	11.1	9.2	2.93	6.2	3.0	3.2
3.0	0.030	61.1	81.86	1.9	0.53	6.47	6.6	11.6	9.8	3.11	6.5	3.3	3.1
3.5	0.035	64.3	81.85	1.8	0.61	6.48	7.1	12.1	10.3	3.26	6.7	3.6	3.2
4.0	0.040	67.4	81.82	1.8	0.70	6.48	7.6	12.6	10.8	3.39	7.0	3.8	3.2
5.0	0.050	72.9	81.72	1.7	0.88	6.49	8.4	13.4	11.7	3.57	7.5	4.2	3.3
6.0	0.060	77.5	81.60	1.6	1.05	6.50	9.1	14.1	12.5	3.68	8.0	4.6	3.4
7.0	0.070	81.6	81.46	1.5	1.23	6.52	9.7	14.7	13.3	3.75	8.4	4.9	3.5
8.0	0.080	85.3	81.32	1.3	1.40	6.53	10.3	15.3	14.0	3.79	8.8	5.1	3.7
9.0	0.090	88.5	81.18	1.2	1.58	6.54	10.8	15.8	14.6	3.81	9.2	5.4	3.8
10.0	0.100	91.4	81.05	1.1	1.75	6.55	11.2	16.2	15.1	3.83	9.5	5.6	4.0
11.0	0.110	94.1	80.93	0.9	1.93	6.56	11.6	16.6	15.6	3.84	9.9	5.8	4.1
12.0	0.120	96.6	80.80	0.8	2.10	6.57	11.9	16.9	16.1	3.84	10.2	6.0	4.2
13.0	0.130	98.4	80.69	0.7	2.28	6.59	12.2	17.2	16.5	3.83	10.4	6.1	4.3

Values @ Failure	0.9	1.93	6.56	11.6	16.6	15.6	3.84	9.9	5.8	4.1	
Failure criteria used*	3	*Note: "1" = Max Deviator Stress; "2" = Deviator Stress @ 15% Strain; "3" = Max Eff. Stress Ratio (s'/s')									



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Tested By EB/KP
Date 01/29/21
Checked By

ASTM D 4767/AASHTO T 297

Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (Multistage per ASTM STP 883)

Client Project #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Laboratory Project #	2104A-05-1
Sample Type	UD
Depth/Elev.	15-17'
Additional Info	-

SPECIMEN PROPERTIES

	(initial)	(after consol.)
Height, in	5.572	5.602
Diameter, in	2.896	2.868
Height-to-Diameter Ratio	1.9	2.0
Area, in ²	6.59	6.46
Volume, cm ³	601.38	593.08
Mass of Wet Sample, g	1218.00	1209.70
Mass of Dry Sample, g	979.35	979.35
Wet Density, pcf	126.4	127.3
Dry Density, pcf	101.7	103.1
Specific Gravity (assumed)	2.700	2.700
Volume of Solids, cm ³	362.72	362.72
Volume of Voids, cm ³	238.65	230.35
Void Ratio	0.66	0.64
% Saturation	100.0	100.0

WATER CONTENT DETERMINATION

	(initial)	(final)
Mass of Wet Sample and Tare, g	1218.00	1209.70
Mass of Dry Sample and Tare, g	979.35	979.35
Mass of Tare, g	0.00	0.00
Moisture, %	24.37	23.52

TEST DATA PRIOR TO LOADING

Volume change (Consolidation), ml	-8.3
Machine Speed, in / min	0.0100
Strain Rate, % / min	0.18
Chamber Pressure, psi	90.0
Back Pressure, psi	80.0
Eff. Consol. Stress, (Minor pr. stress, s ₃), psi	10.0
Change in Height, in	-0.030
"B" Value	0.95

SHEAR DATA

Deformation Stage 2 (inch)	Total Deformation ST.1 + ST.2 (inch)	Axial Load (lb)	Pore-Water Pressure, psi		Strain Stage 2 %	Corrected Area (in ²)	Dev. Stress (Ds=s ₁ -s ₃) (psi)	Major Principal Stress, psi		Effective Stress Ratio s' ₁ /s' ₃	P' (s' ₁ +s' ₃)/2 (psi)	Q (s ₁ -s ₃)/2 (psi)	Eff. Minor Pr. Stress s' ₃ (psi)	Total Strain ST.1 + ST.2 %
			Total, U	Change, DU				Total s ₁	Eff. s' ₁					
0.000	0.100	20.3	80.00	0.0	0.00	6.46	0.0	10.0	10.0	1.00	10.0	0.0	10.0	1.75
0.005	0.105	47.4	81.29	1.3	0.09	6.47	4.2	14.2	12.9	1.48	10.8	2.1	8.7	1.84
0.010	0.110	67.9	82.21	2.2	0.18	6.47	7.4	17.4	15.1	1.94	11.5	3.7	7.8	1.93
0.015	0.115	80.5	82.54	2.5	0.27	6.48	9.3	19.3	16.8	2.25	12.1	4.6	7.5	2.02
0.020	0.120	91.3	82.69	2.7	0.36	6.48	11.0	21.0	18.3	2.50	12.8	5.5	7.3	2.10
0.025	0.125	100.2	82.76	2.8	0.45	6.49	12.3	22.3	19.6	2.70	13.4	6.2	7.2	2.19
0.030	0.130	107.7	82.80	2.8	0.54	6.50	13.5	23.5	20.7	2.87	13.9	6.7	7.2	2.28
0.035	0.135	114.3	82.82	2.8	0.62	6.50	14.5	24.5	21.6	3.01	14.4	7.2	7.2	2.37
0.040	0.140	119.1	82.83	2.8	0.71	6.51	15.2	25.2	22.4	3.12	14.8	7.6	7.2	2.46
0.050	0.150	126.3	82.83	2.8	0.89	6.52	16.3	26.3	23.4	3.27	15.3	8.1	7.2	2.63
0.060	0.160	131.2	82.81	2.8	1.07	6.53	17.0	27.0	24.2	3.36	15.7	8.5	7.2	2.81
0.070	0.170	134.9	82.76	2.8	1.25	6.54	17.5	27.5	24.8	3.42	16.0	8.8	7.2	2.98
0.080	0.180	137.8	82.71	2.7	1.43	6.55	17.9	27.9	25.2	3.46	16.3	9.0	7.3	3.16
0.090	0.190	140.3	82.65	2.7	1.61	6.57	18.3	28.3	25.6	3.49	16.5	9.1	7.3	3.33
0.100	0.200	142.6	82.58	2.6	1.79	6.58	18.6	28.6	26.0	3.51	16.7	9.3	7.4	3.51
0.110	0.210	144.7	82.51	2.5	1.96	6.59	18.9	28.9	26.4	3.52	16.9	9.4	7.5	3.68
0.120	0.220	146.7	82.45	2.5	2.14	6.60	19.1	29.1	26.7	3.54	17.1	9.6	7.6	3.86
0.130	0.230	148.6	82.38	2.4	2.32	6.61	19.4	29.4	27.0	3.55	17.3	9.7	7.6	4.03
0.140	0.240	150.4	82.31	2.3	2.50	6.63	19.6	29.6	27.3	3.55	17.5	9.8	7.7	4.21
0.150	0.250	152.2	82.24	2.2	2.68	6.64	19.9	29.9	27.6	3.56	17.7	9.9	7.8	4.38
0.160	0.260	153.8	82.18	2.2	2.86	6.65	20.1	30.1	27.9	3.57	17.9	10.0	7.8	4.56

Values @ Failure

2.2 2.86 6.65 20.1 30.1 27.9 **3.57** 17.9 10.0 7.8 4.56

Failure criteria used*

3 *Note: "1" = Max Deviator Stress; "2" = Deviator Stress @ 15% Strain; "3" = Max Eff. Stress Ratio (s'₁/s'₃)



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Tested By: EB/KP
Date: 01/30/21
Checked By:

ASTM D 4767/AASHTO T 297

Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (Multistage per ASTM STP 883)

Client Project #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Laboratory Project #	2104A-05-1
Sample Type	UD
Depth/Elev.	15-17'
Additional Info	-

SPECIMEN PROPERTIES

	(initial)	(after consol.)
Height, in	5.442	5.482
Diameter, in	2.910	2.867
Height-to-Diameter Ratio	1.9	1.9
Area, in ²	6.65	6.46
Volume, cm ³	593.08	579.98
Mass of Wet Sample, g	1209.70	1196.60
Mass of Dry Sample, g	979.35	979.35
Wet Density, pcf	127.3	128.8
Dry Density, pcf	103.1	105.4
Specific Gravity (assumed)	2.700	2.700
Volume of Solids, cm ³	362.72	362.72
Volume of Voids, cm ³	230.35	217.25
Void Ratio	0.64	0.60
% Saturation	100.0	100.0

WATER CONTENT DETERMINATION

	(initial)	(final)
Mass of Wet Sample and Tare, g	1209.70	1500.00
Mass of Dry Sample and Tare, g	979.35	1282.80
Mass of Tare, g	0.00	303.70
Moisture, %	23.52	22.18

TEST DATA PRIOR TO LOADING

Volume change (Consolidation), ml	-13.1
Machine Speed, in / min	0.01000
Strain Rate, % / min	0.18
Chamber Pressure, psi	100.0
Back Pressure, psi	80.0
Eff. Consol. Stress, (Minor pr. stress, s ₃), psi	20.0
Change in Height, in	-0.040
"B" Value	0.95

SHEAR DATA

Deformation Stage 3 (inch)	Total Deformation ST.1 + ST.2 + ST.3 (inch)	Axial Load (lb)	Pore-Water Pressure, psi		Strain Stage 3 %	Corrected Area (in ²)	Deviator Stress (Ds=s ₁ -s ₃) (psi)	Major Principal Stress, psi		Effective Stress Ratio s' ₁ /s' ₃	P' (s' ₁ +s' ₃)/2 (psi)	Q (s ₁ -s ₃)/2 (psi)	Eff. Minor Pr. Stress s' ₃ (psi)	Total Strain ST.1 + ST.2 + ST.3, %
			Total, U	Change, DU				Total s ₁	Eff. s' ₁					
0.000	0.220	29.0	80.00	0.0	0.00	6.46	0.0	20.0	20.0	1.00	20.0	0.0	20.0	3.86
0.010	0.230	113.9	85.03	5.0	0.18	6.47	13.1	33.1	28.1	1.88	21.5	6.6	15.0	4.03
0.020	0.240	147.1	86.40	6.4	0.36	6.48	18.2	38.2	31.8	2.34	22.7	9.1	13.6	4.21
0.030	0.250	169.7	86.94	6.9	0.55	6.49	21.7	41.7	34.7	2.66	23.9	10.8	13.1	4.38
0.040	0.260	185.9	87.26	7.3	0.73	6.50	24.1	44.1	36.9	2.89	24.8	12.1	12.7	4.56
0.050	0.270	196.8	87.46	7.5	0.91	6.52	25.7	45.7	38.3	3.05	25.4	12.9	12.5	4.73
0.070	0.290	209.8	87.71	7.7	1.28	6.54	27.6	47.6	39.9	3.25	26.1	13.8	12.3	5.09
0.100	0.320	219.8	87.79	7.8	1.82	6.58	29.0	49.0	41.2	3.38	26.7	14.5	12.2	5.61
0.120	0.340	224.3	87.83	7.8	2.19	6.60	29.6	49.6	41.8	3.43	27.0	14.8	12.2	5.96
0.150	0.370	230.3	87.75	7.7	2.74	6.64	30.3	50.3	42.6	3.47	27.4	15.2	12.3	6.49
0.170	0.390	234.1	87.66	7.7	3.10	6.66	30.8	50.8	43.1	3.49	27.7	15.4	12.3	6.84
0.200	0.420	239.5	87.51	7.5	3.65	6.70	31.4	51.4	43.9	3.52	28.2	15.7	12.5	7.37
0.230	0.450	244.8	87.34	7.3	4.20	6.74	32.0	52.0	44.7	3.53	28.7	16.0	12.7	7.89
0.260	0.480	250.0	87.17	7.2	4.74	6.78	32.6	52.6	45.4	3.54	29.1	16.3	12.8	8.42
0.280	0.500	253.6	87.05	7.0	5.11	6.80	33.0	53.0	46.0	3.55	29.5	16.5	13.0	8.77
0.310	0.530	258.6	86.85	6.9	5.65	6.84	33.6	53.6	46.7	3.55	29.9	16.8	13.1	9.29
0.360	0.580	267.0	86.53	6.5	6.57	6.91	34.4	54.4	47.9	3.56	30.7	17.2	13.5	10.17
0.410	0.630	275.4	86.19	6.2	7.48	6.98	35.3	55.3	49.1	3.56	31.5	17.7	13.8	11.05
0.470	0.690	284.3	85.81	5.8	8.57	7.06	36.2	56.2	50.3	3.55	32.3	18.1	14.2	12.10
0.520	0.740	291.5	85.49	5.5	9.49	7.13	36.8	56.8	51.3	3.54	32.9	18.4	14.5	12.98
0.610	0.830	303.9	85.03	5.0	11.13	7.26	37.8	57.8	52.8	3.53	33.9	18.9	15.0	14.56
0.630	0.850	306.6	84.92	4.9	11.49	7.29	38.1	58.1	53.1	3.52	34.1	19.0	15.1	14.91
0.640	0.860	308.0	84.87	4.9	11.67	7.31	38.2	58.2	53.3	3.52	34.2	19.1	15.1	15.08

Values @ Failure: 6.2, 7.48, 6.98, 35.3, 55.3, 49.1, **3.56**, 31.5, 17.7, 13.8, 11.05

Failure criteria used*

3

*Note: "1" = Max Deviator Stress; "2" = Deviator Stress @ 15% Strain; "3" = Max Eff. Stress Ratio (s'₁/s'₃)



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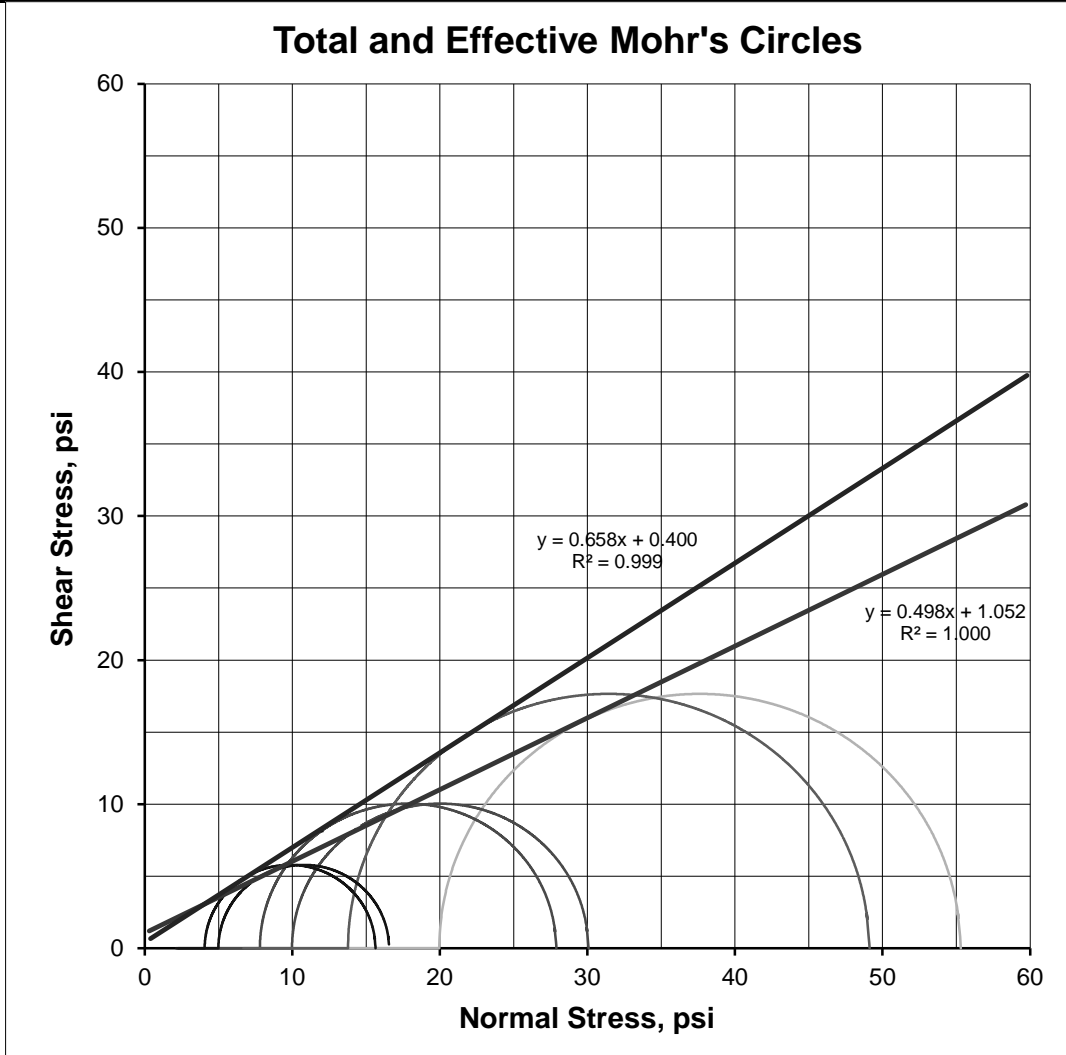
Tested By	EB/KP
Date	01/30/21
Check	<i>EB</i>

ASTM D 4767/AASHTO T 297

Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (Multistage per ASTM STP 883)

Client Project #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Laboratory Project #	2104A-05-1
Sample Type	UD
Depth/Elev.	15-17'
Additional Info	-



	ST. 1	ST. 2	ST. 3
Effective Consolidation Stress, psi	5.0	10.0	20.0
Deviator Stress at Failure, psi	11.6	20.1	35.3
Effective Minor Principal Stress at Failure, psi	4.1	7.8	13.8
Effective Major Principal Stress at Failure, psi	15.6	27.9	49.1
Axial Strain at Failure, %	1.93	2.86	7.48

STRENGTH PARAMETERS*			
Total		Effective	
f °	26.5	f ' °	33.4
C, psi	1.1	C', psi	0.4

*Valid only for Received Material at Reported Densities and Moisture Contents. Please see remarks on page 6 of this report



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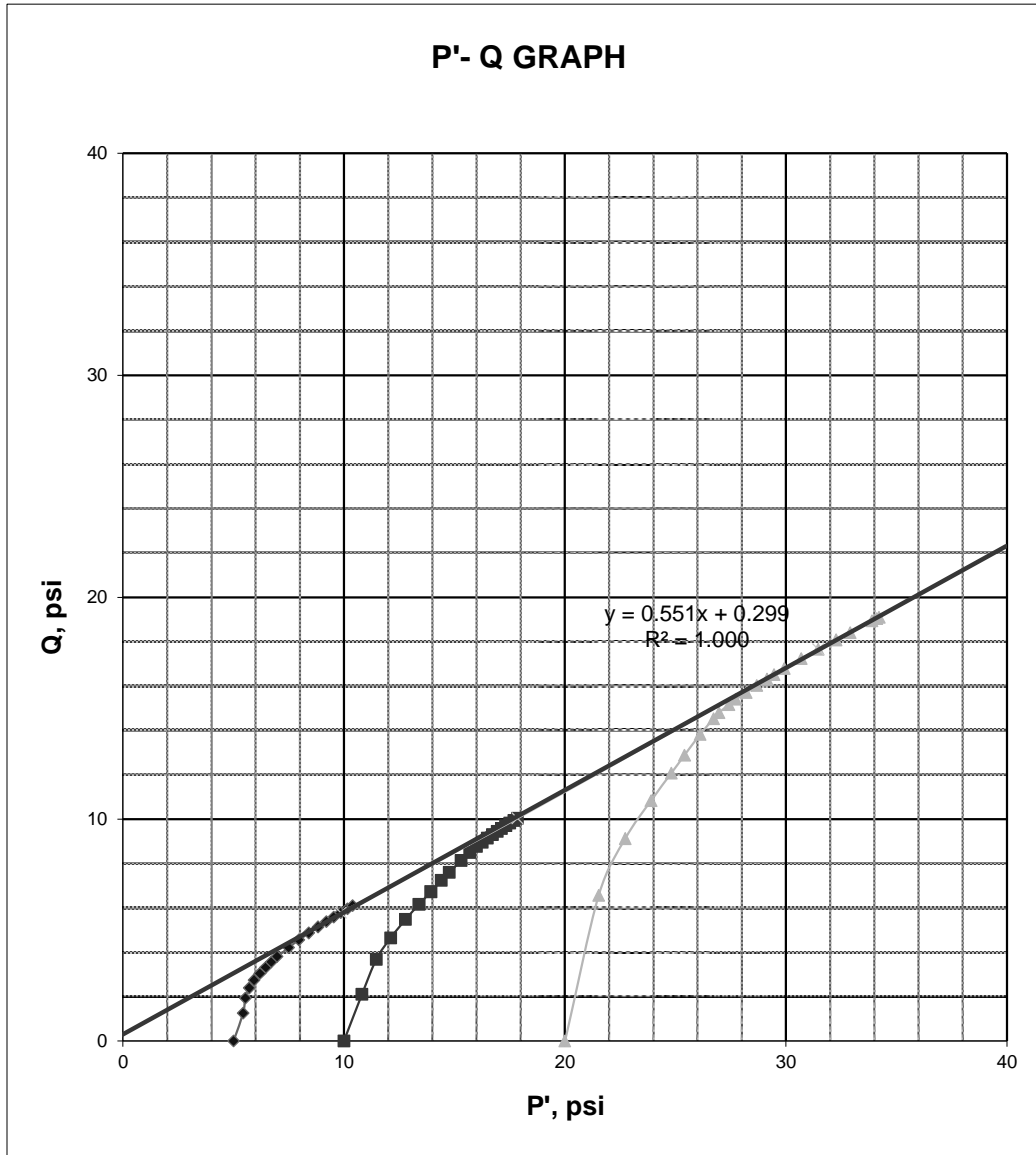
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Date	01/30/21
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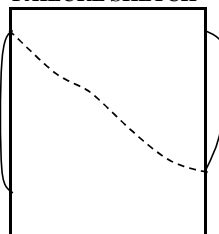
Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (Multistage per ASTM STP 883)

Client Project #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Laboratory Project #	2104A-05-1
Sample Type	UD
Depth/Elev.	15-17'
Additional Info	-



FAILURE SKETCH



a, psi
 a, degree

0.3
28.8



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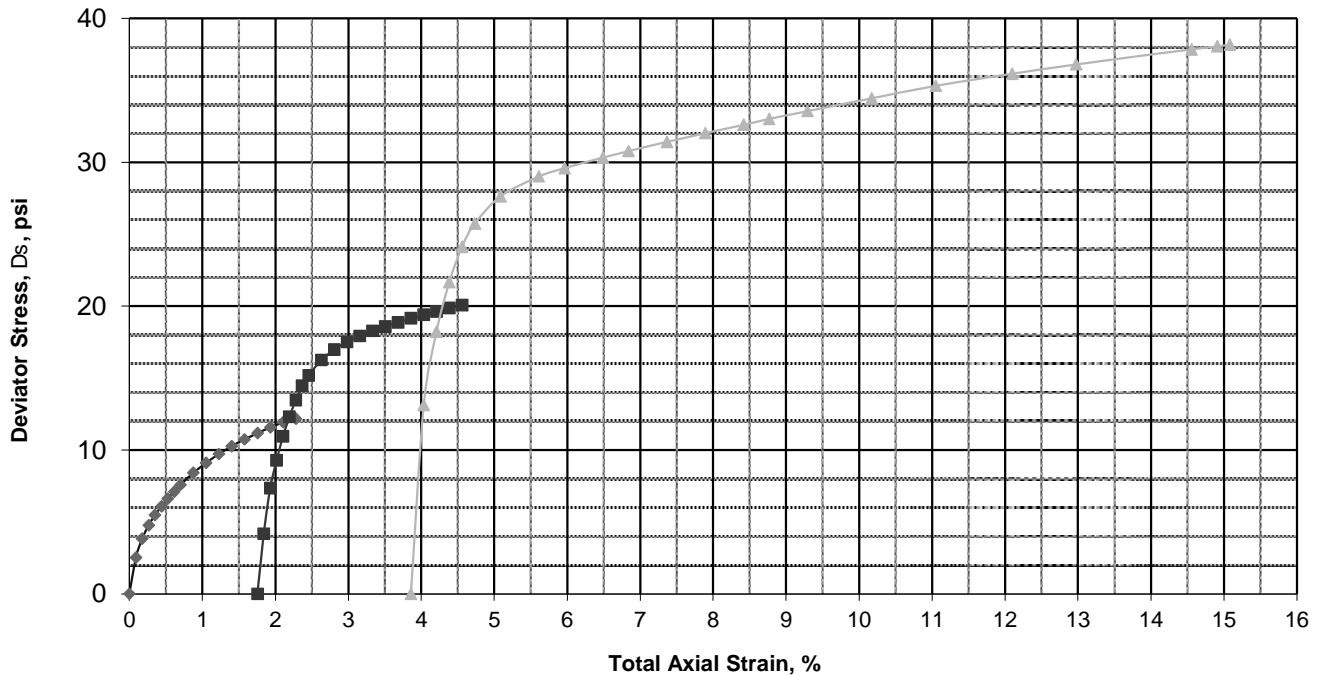
ASTM D 4767/AASHTO T 297

Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (Multistage per ASTM STP 883)

Client Project #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Laboratory Project #	2104A-05-1
Sample Type	UD
Depth/Elev.	15-17'
Additional Info	-

Deviator Stress - Strain Graph



		REMARKS	DESCRIPTION
Balance ID Number	563/700	Material from shelly tube was not homogeneous and/or not long enough to select 3 uniform specimens 6" long each. Most representative portion of sample (5" above the bottom of shelly tube) was selected for multi-stage triaxial testing (per ASTM STP 883).	NA
Oven ID Number	496/610		
Deformation Indicator ID #	178/349/689		
Digital Caliper ID #	370/458		
Load Cell ID #	11/347/692		
Apparatus ID #	10/293/693		
			USCS (ASTM D2487: D2488)
			NA

NOTES:

- Method for Saturation
- Method for determination of cross-sectional area after consol.
- Final moisture content (Stage 3) obtained from entire sample

WET	LL	-
B	PL	-
	PI	-
	Gs	-



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Date 01/30/21

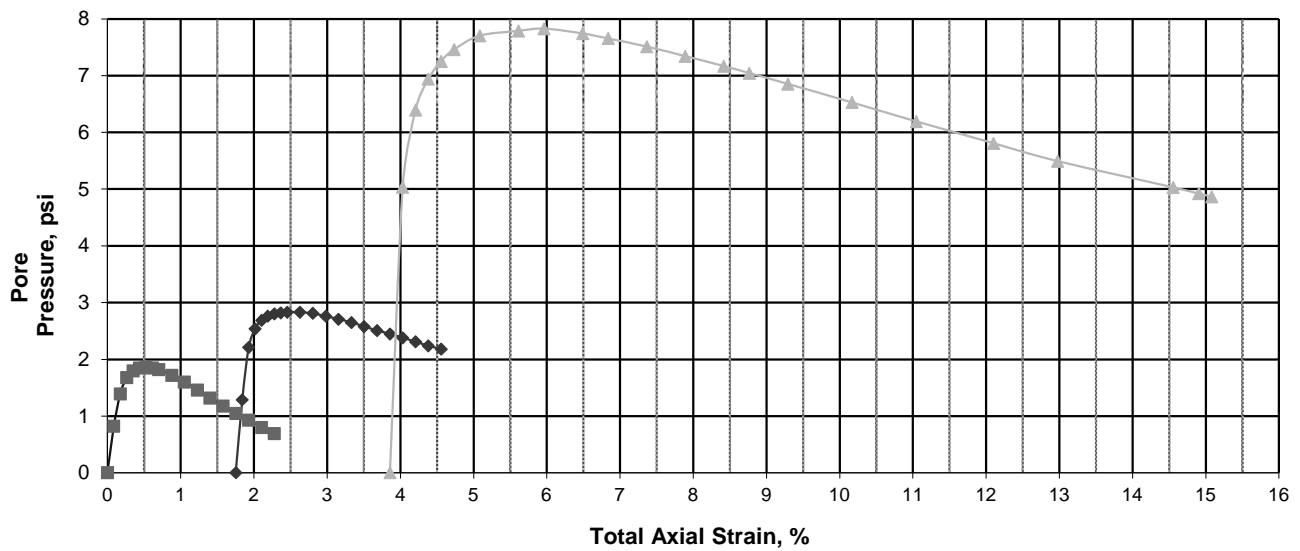
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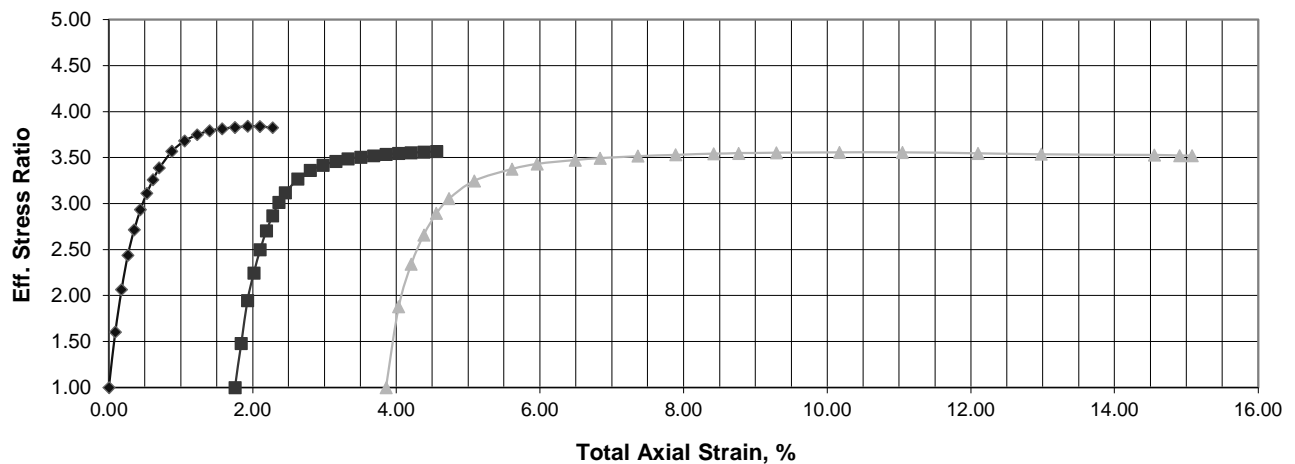
Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (Multistage per ASTM STP 883)

Client Project #	2021003	Laboratory Project #	2104A-05-1
Project Name	James Brown Arena	Sample Type	UD
Sample ID	37083/B-4	Depth/Elev.	15-17'
Location	B-4	Additional Info	-

Pore Pressure - Strain Graph



Effective Stress Ratio-Strain Graph





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Tested By: **KP**
Date: **01/28/21**
Checked By: **[Signature]**

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	15-17'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 2

Pressure* on Specimen, lbf/ft²

250

Selection	4
m ₁	4.30
m ₂	3.74

X	Y
0	15.39
1	19.12

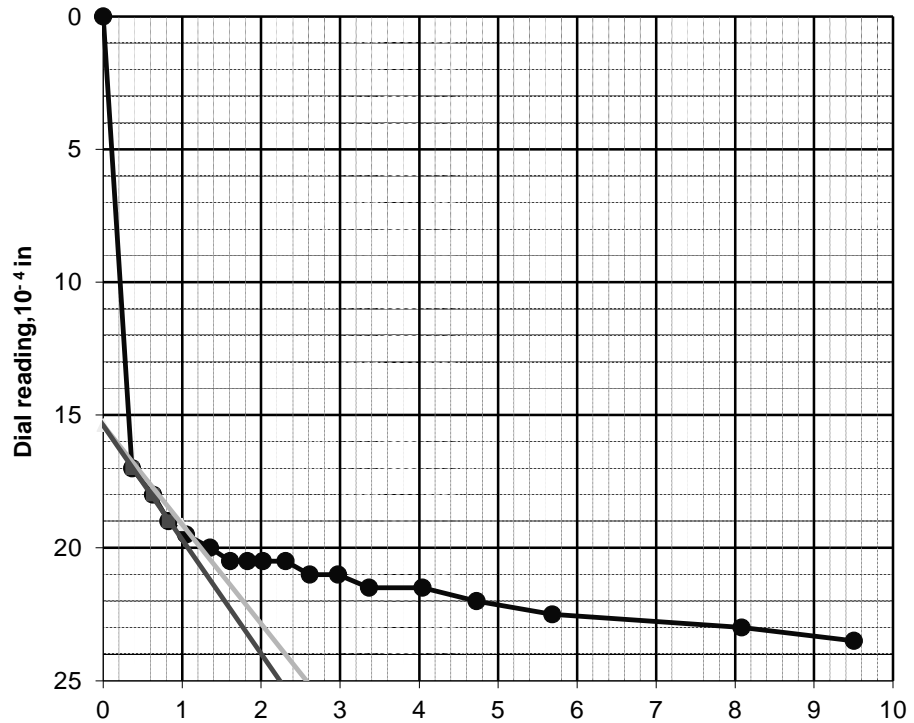
d ₀	15.4
d ₉₀	19
d ₁₀₀	20
d ₅₀	18
sq.root t ₉₀	1.1
t _{90, min}	1.21
sq.root t ₅₀	0.53
t _{50, min}	0.28

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	0.0
2	0.13	0.37	17.0
3	0.40	0.63	18.0
4	0.68	0.83	19.0
5	1.10	1.05	19.5
6	1.83	1.35	20.0
7	2.58	1.61	20.5
8	3.33	1.83	20.5
9	4.08	2.02	20.5
10	5.33	2.31	20.5
11	6.83	2.61	21.0
12	8.8	2.97	21.0
13	11.3	3.37	21.5
14	16.3	4.04	21.5
15	22.3	4.73	22.0
16	32.3	5.69	22.5
17	65.3	8.08	23.0
18	90.3	9.50	23.5
19			
20			

Time-Deformation Curve From Square Root of Time Method



y = 4.298x + 15.387
R² = 0.992

y = 3.74x + 15.39



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Tested By **KP**
Date **01/28/21**
Checked By **[Signature]**

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	15-17'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 3

Pressure* on Specimen, lbf/ft²

500

Selection	4
m ₁	5.98
m ₂	5.20

X	Y
0	41.56
1	46.76

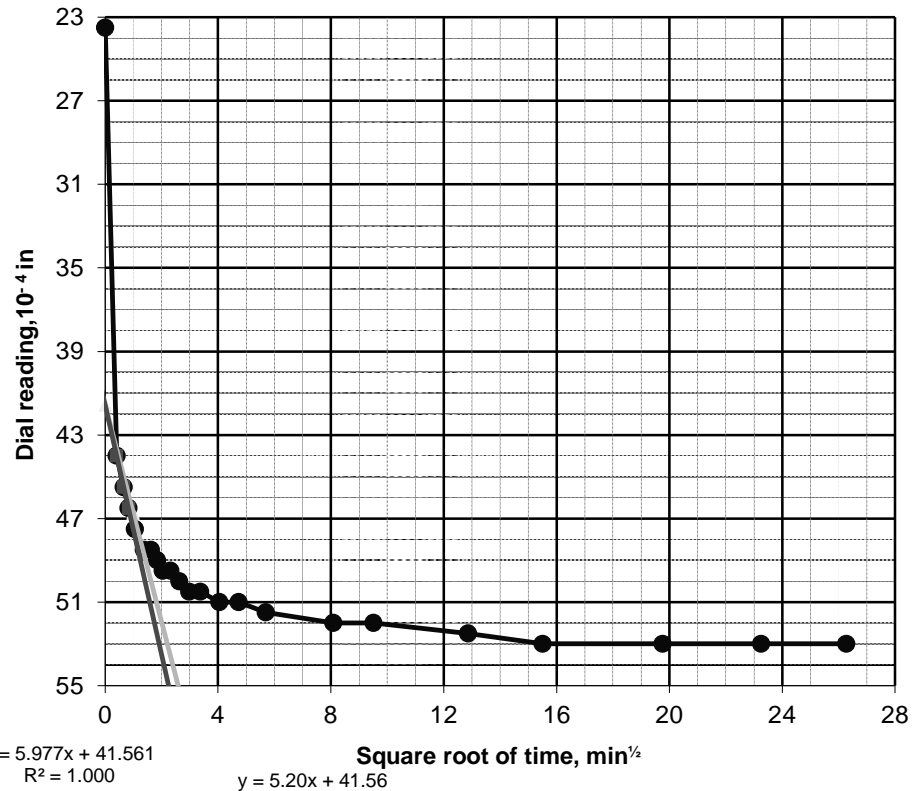
d ₀	41.6
d ₉₀	48
d ₁₀₀	49
d ₅₀	45
sq.root t ₉₀	1.3
t _{90, min}	1.69
sq.root t ₅₀	0.63
t _{50, min}	0.39

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	23.5
2	0.17	0.41	44.0
3	0.43	0.66	45.5
4	0.68	0.83	46.5
5	1.12	1.06	47.5
6	1.88	1.37	48.5
7	2.63	1.62	48.5
8	3.38	1.84	49.0
9	4.13	2.03	49.5
10	5.38	2.32	49.5
11	6.88	2.62	50.0
12	8.9	2.98	50.5
13	11.4	3.37	50.5
14	16.4	4.05	51.0
15	22.4	4.73	51.0
16	32.4	5.69	51.5
17	65.4	8.09	52.0
18	90.4	9.51	52.0
19	165.4	12.86	52.5
20	240.4	15.50	53.0
	390.4	19.76	53.0
	540.4	23.25	53.0
	690.4	26.28	53.0

Time-Deformation Curve From Square Root of Time Method





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Tested By: **KP**
Date: **01/29/21**
Checked By: **[Signature]**

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	15-17'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 4

Pressure* on Specimen, lbf/ft²

1000

Selection	6
m ₁	7.33
m ₂	6.37

X	Y
0	87.39
1	93.76

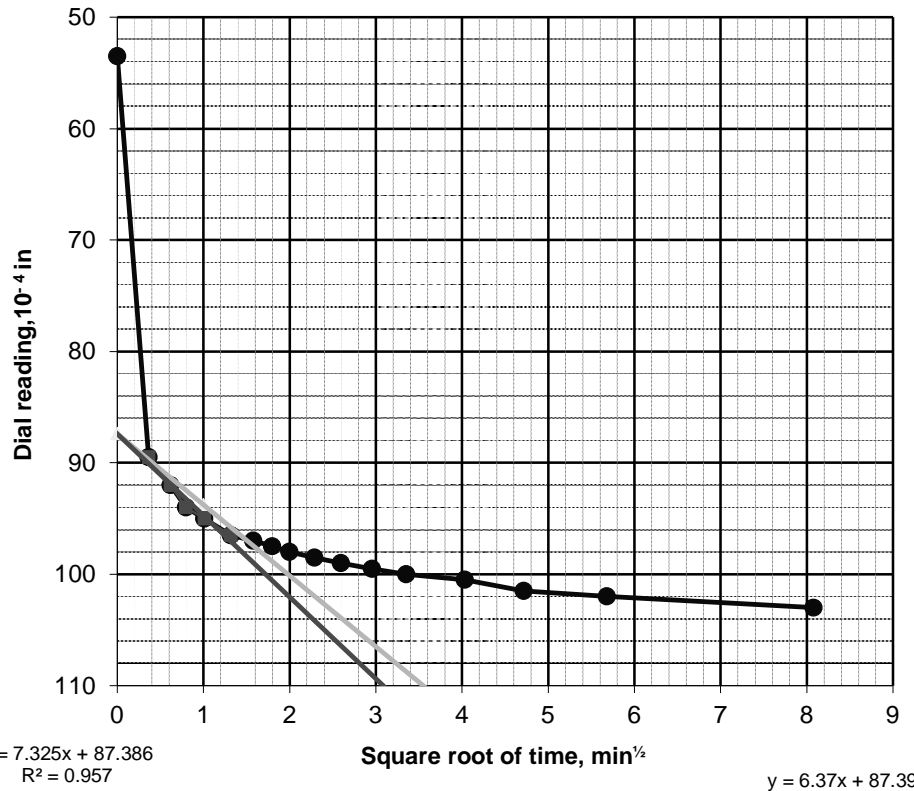
d ₀	87.4
d ₉₀	97
d ₁₀₀	98
d ₅₀	93
sq.root t ₉₀	1.5
t ₉₀ , min	2.25
sq.root t ₅₀	0.72
t ₅₀ , min	0.53

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	53.5
2	0.13	0.37	89.5
3	0.38	0.62	92.0
4	0.63	0.80	94.0
5	1.02	1.01	95.0
6	1.73	1.32	96.5
7	2.48	1.58	97.0
8	3.23	1.80	97.5
9	3.98	2.00	98.0
10	5.23	2.29	98.5
11	6.73	2.59	99.0
12	8.7	2.96	99.5
13	11.2	3.35	100.0
14	16.2	4.03	100.5
15	22.2	4.72	101.5
16	32.2	5.68	102.0
17	65.2	8.08	103.0
18			
19			
20			

Time-Deformation Curve From Square Root of Time Method





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Tested By **KP**
Date **01/29/21**
Checked By **[Signature]**

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	15-17'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 5

Pressure* on Specimen, lbf/ft²

250

Selection	3
m ₁	-3.60
m ₂	-3.13

X	Y
0	94.23
1	91.10

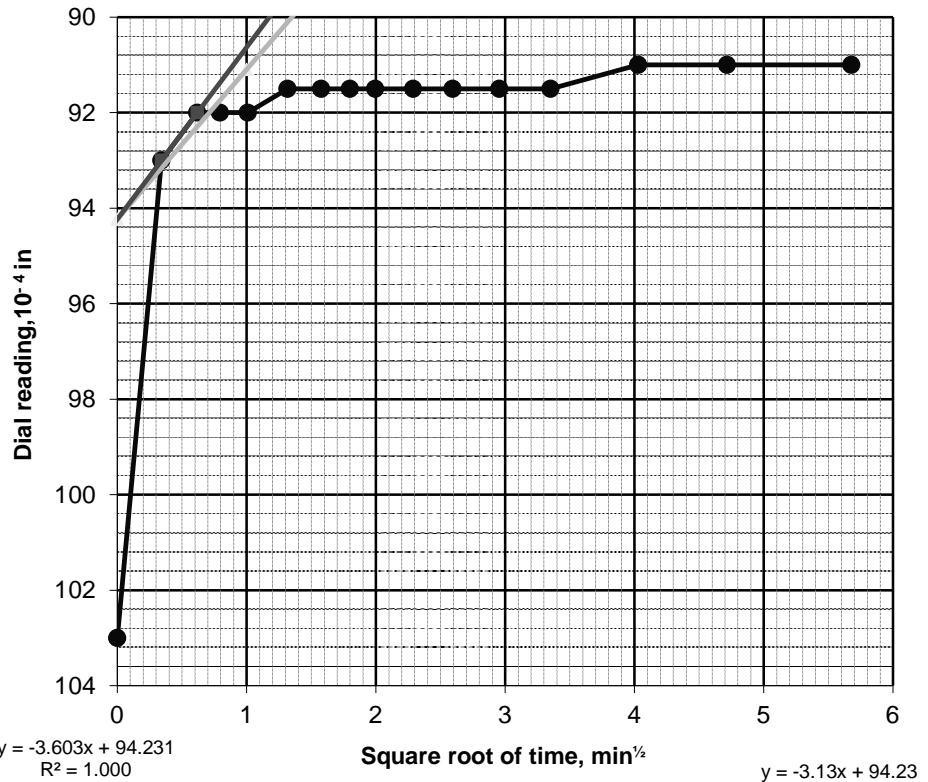
d ₀	94.2
d ₉₀	92
d ₁₀₀	92
d ₅₀	93
sq.root t ₉₀	0.7
t _{90, min}	0.49
sq.root t ₅₀	0.34
t _{50, min}	0.11

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	103.0
2	0.12	0.34	93.0
3	0.38	0.62	92.0
4	0.63	0.80	92.0
5	1.02	1.01	92.0
6	1.73	1.32	91.5
7	2.48	1.58	91.5
8	3.23	1.80	91.5
9	3.98	2.00	91.5
10	5.23	2.29	91.5
11	6.73	2.59	91.5
12	8.7	2.96	91.5
13	11.2	3.35	91.5
14	16.2	4.03	91.0
15	22.2	4.72	91.0
16	32.2	5.68	91.0
17			
18			
19			
20			

Time-Deformation Curve From Square Root of Time Method





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Date **01/29/21**
Checked By **[Signature]**

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	15-17'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 6

Pressure* on Specimen, lbf/ft²

500

Selection	4
m ₁	2.31
m ₂	2.01

X	Y
0	93.31
1	95.32

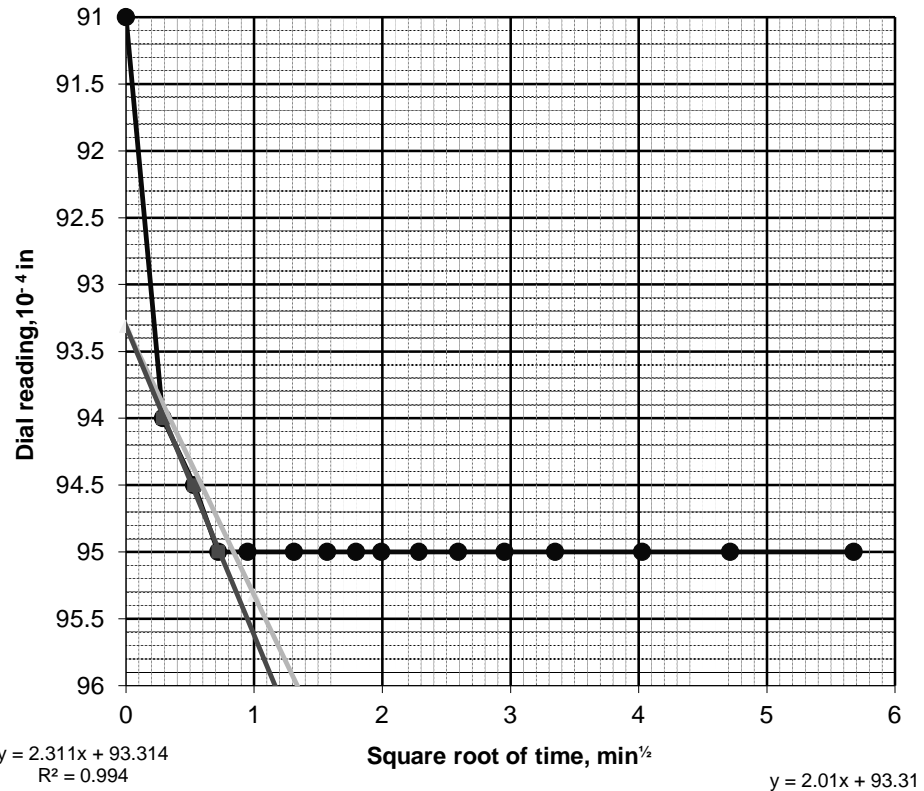
d ₀	93.3
d ₉₀	95
d ₁₀₀	95
d ₅₀	94
sq.root t ₉₀	0.85
t _{90, min}	0.72
sq.root t ₅₀	0.41
t _{50, min}	0.17

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	91.0
2	0.08	0.29	94.0
3	0.28	0.53	94.5
4	0.52	0.72	95.0
5	0.90	0.95	95.0
6	1.72	1.31	95.0
7	2.47	1.57	95.0
8	3.22	1.79	95.0
9	3.97	1.99	95.0
10	5.22	2.28	95.0
11	6.72	2.59	95.0
12	8.7	2.95	95.0
13	11.2	3.35	95.0
14	16.2	4.03	95.0
15	22.2	4.71	95.0
16	32.2	5.68	95.0
17			
18			
19			
20			

Time-Deformation Curve From Square Root of Time Method





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Tested By: **KP**
Date: **01/29/21**
Checked By: **[Signature]**

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	15-17'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 7

Pressure* on Specimen, lbf/ft²

1000

Selection	5
m ₁	2.92
m ₂	2.54

X	Y
0	104.03
1	106.57

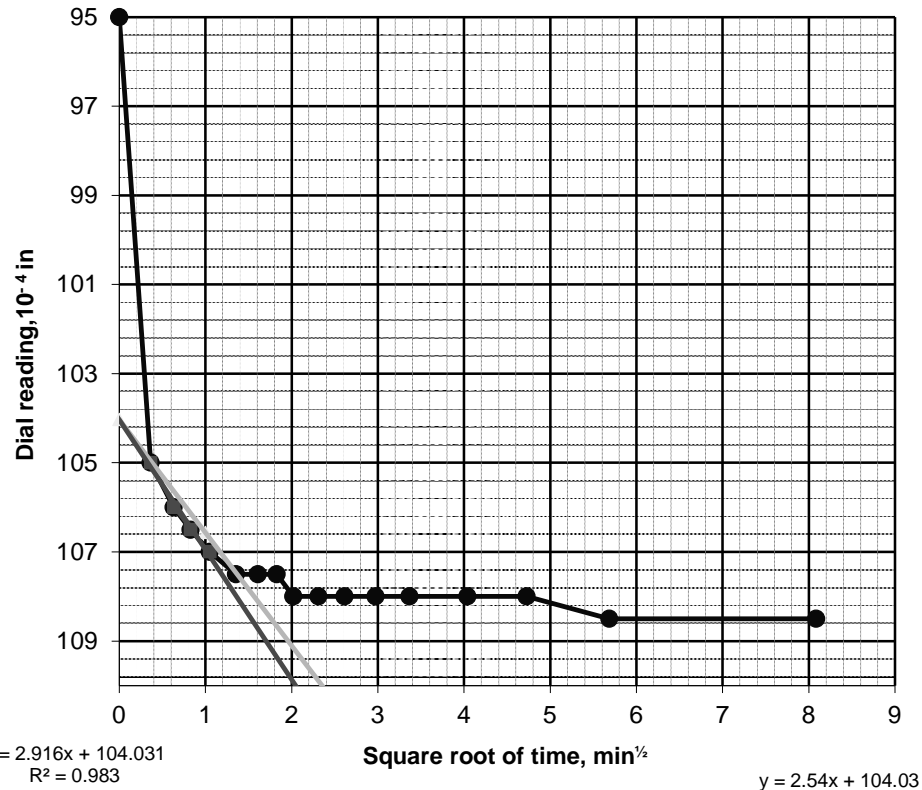
d ₀	104.0
d ₉₀	107
d ₁₀₀	108
d ₅₀	106
sq.root t ₉₀	1.35
t ₉₀ , min	1.82
sq.root t ₅₀	0.65
t ₅₀ , min	0.43

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	95.0
2	0.13	0.37	105.0
3	0.40	0.63	106.0
4	0.68	0.83	106.5
5	1.10	1.05	107.0
6	1.83	1.35	107.5
7	2.58	1.61	107.5
8	3.33	1.83	107.5
9	4.08	2.02	108.0
10	5.33	2.31	108.0
11	6.83	2.61	108.0
12	8.8	2.97	108.0
13	11.3	3.37	108.0
14	16.3	4.04	108.0
15	22.3	4.73	108.0
16	32.3	5.69	108.5
17	65.3	8.08	108.5
18			
19			
20			

Time-Deformation Curve From Square Root of Time Method





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Tested By **KP**
Date **01/29/21**
Checked By **[Signature]**

Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	15-17'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 8

Pressure* on Specimen, lbf/ft²

2000

Selection	6
m ₁	11.81
m ₂	10.27

X	Y
0	165.65
1	175.91

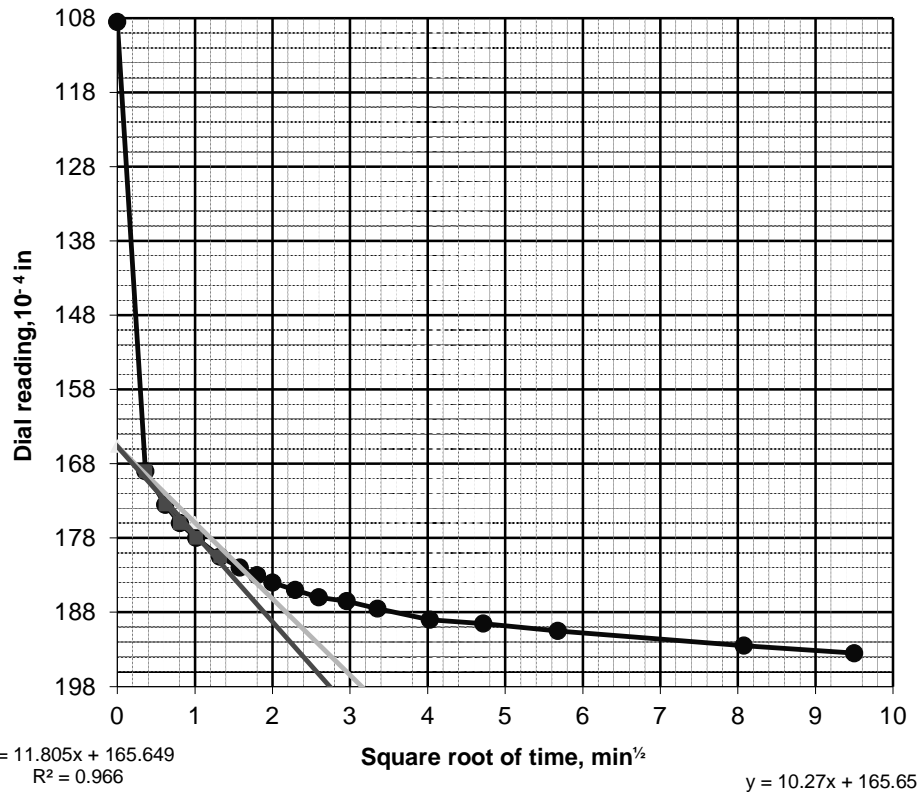
d ₀	165.6
d ₉₀	182
d ₁₀₀	183
d ₅₀	174
sq.root t ₉₀	1.55
t _{90, min}	2.40
sq.root t ₅₀	0.75
t _{50, min}	0.56

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	108.5
2	0.13	0.37	169.0
3	0.38	0.62	173.5
4	0.65	0.81	176.0
5	1.03	1.02	178.0
6	1.75	1.32	180.5
7	2.50	1.58	182.0
8	3.25	1.80	183.0
9	4.00	2.00	184.0
10	5.25	2.29	185.0
11	6.75	2.60	186.0
12	8.8	2.96	186.5
13	11.3	3.35	187.5
14	16.3	4.03	189.0
15	22.3	4.72	189.5
16	32.3	5.68	190.5
17	65.3	8.08	192.5
18	90.3	9.50	193.5
19			
20			

Time-Deformation Curve From Square Root of Time Method





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Date **01/29/21**
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Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	15-17'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 9

**Pressure* on
Specimen, lbf/ft²**

4000

Selection	7
m ₁	19.09
m ₂	16.60

X	Y
0	293.46
1	310.06

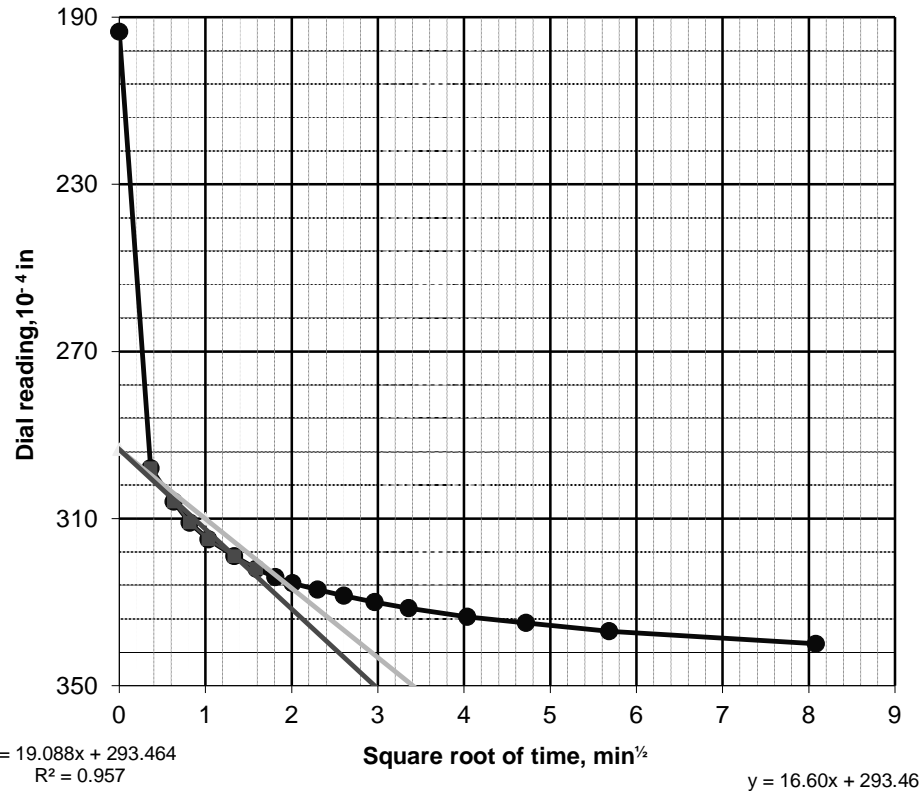
d ₀	293.5
d ₉₀	324
d ₁₀₀	328
d ₅₀	311
sq.root t ₉₀	1.85
t ₉₀ , min	3.42
sq.root t ₅₀	0.89
t ₅₀ , min	0.80

d=dial gauge reading, 10⁻⁴ in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	193.5
2	0.13	0.37	298.0
3	0.40	0.63	306.0
4	0.67	0.82	311.0
5	1.07	1.03	315.0
6	1.78	1.34	319.0
7	2.53	1.59	322.0
8	3.28	1.81	324.0
9	4.03	2.01	325.5
10	5.28	2.30	327.0
11	6.78	2.60	328.5
12	8.8	2.96	330.0
13	11.3	3.36	331.5
14	16.3	4.04	333.5
15	22.3	4.72	335.0
16	32.3	5.68	337.0
17	65.3	8.08	340.0
18			
19			
20			

Time-Deformation Curve From Square Root of Time Method





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Date **01/29/21**
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Client Pr. #	2021003
Project Name	James Brown Arena
Sample ID	37083/B-4
Location	B-4

Lab. PR. #	2104A-05-1
S. Type	UD
Depth/Elev.	15-17'
Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 10

Pressure* on Specimen, lbf/ft²

8000

Selection	8
m ₁	29.52
m ₂	25.67

X	Y
0	523.23
1	548.90

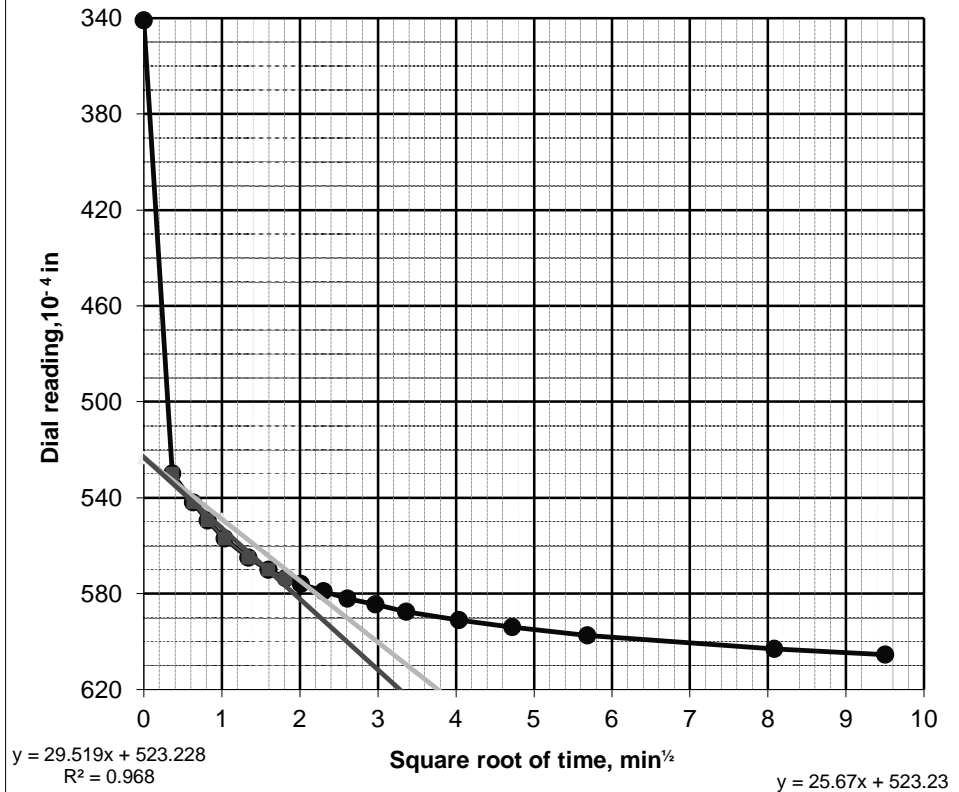
d ₀	523.2
d ₉₀	577
d ₁₀₀	583
d ₅₀	553
sq.root t ₉₀	2.1
t _{90, min}	4.41
sq.root t ₅₀	1.01
t _{50, min}	1.03

d=dial gauge reading, 10⁻⁴ in

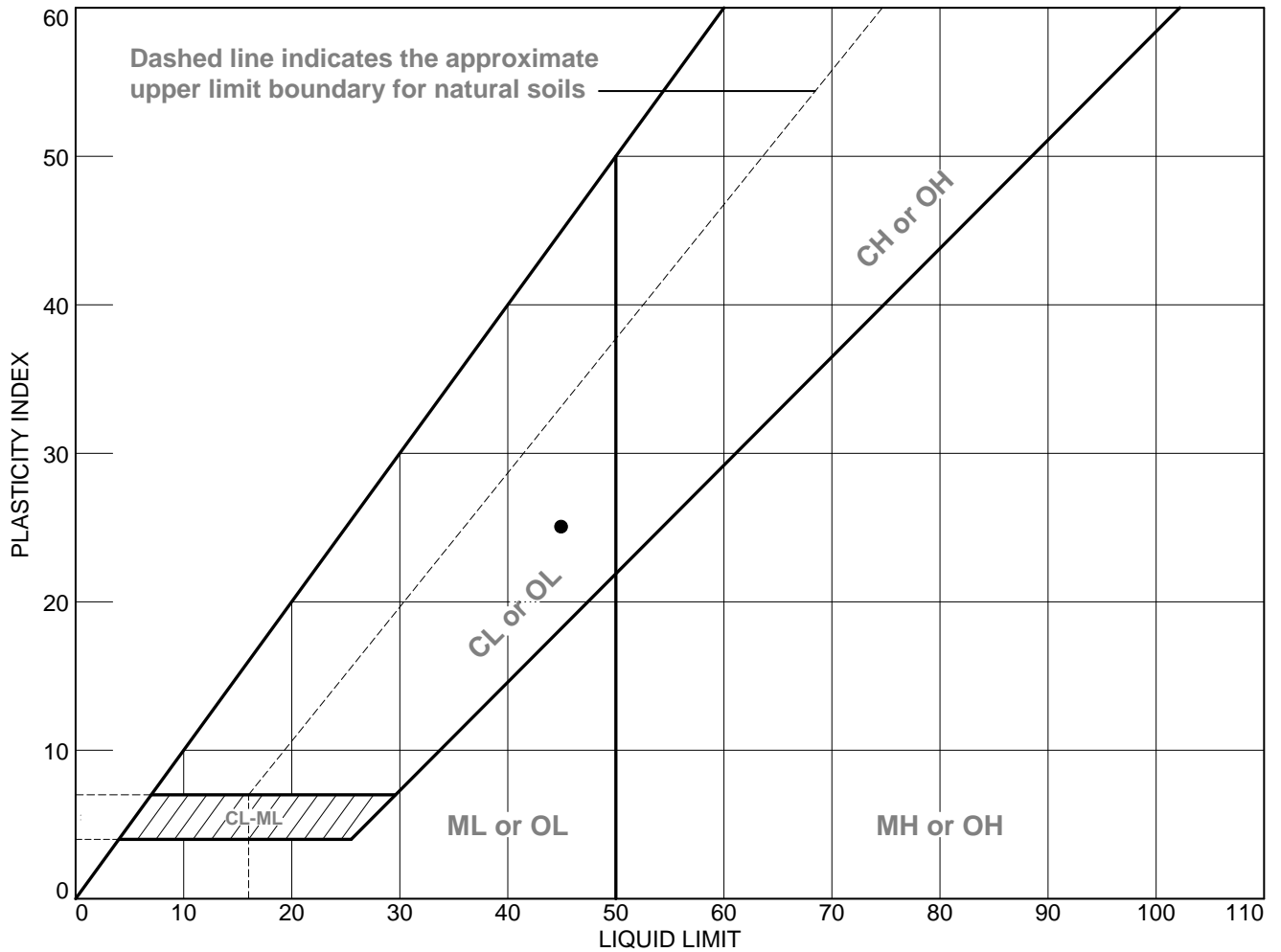
Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.

Point #	Time, min	Square Root of Time, min ^{1/2}	Dial Gauge Reading, 10 ⁻⁴ in
1	0	0	341.0
2	0.13	0.37	530.0
3	0.40	0.63	542.0
4	0.67	0.82	549.5
5	1.07	1.03	557.0
6	1.80	1.34	565.0
7	2.55	1.60	570.0
8	3.30	1.82	573.5
9	4.05	2.01	576.0
10	5.30	2.30	579.0
11	6.80	2.61	582.0
12	8.8	2.97	584.5
13	11.3	3.36	587.5
14	16.3	4.04	591.0
15	22.3	4.72	594.0
16	32.3	5.68	597.5
17	65.3	8.08	603.0
18	90.3	9.50	605.5
19			
20			

Time-Deformation Curve From Square Root of Time Method



LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-7	5	13.5-15 Ft	33.2	20	45	25	

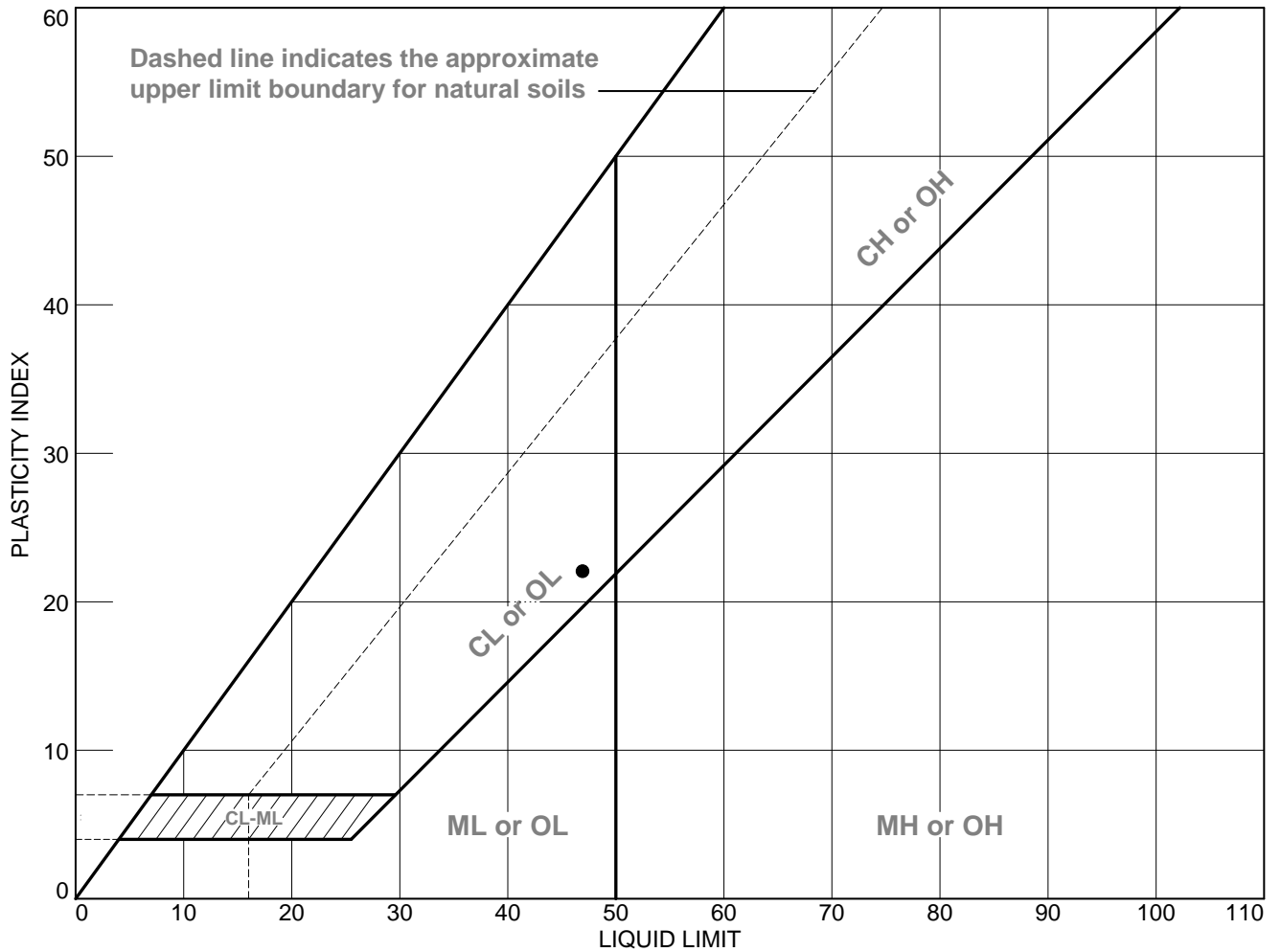
**Nova Engineering
& Environmental
Norcross, GA**

Client: H.J. Russell & Company
Project: James Brown Arena

Project No.: 2021003

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-9	7	23.5-25 Ft	29.3	25	47	22	

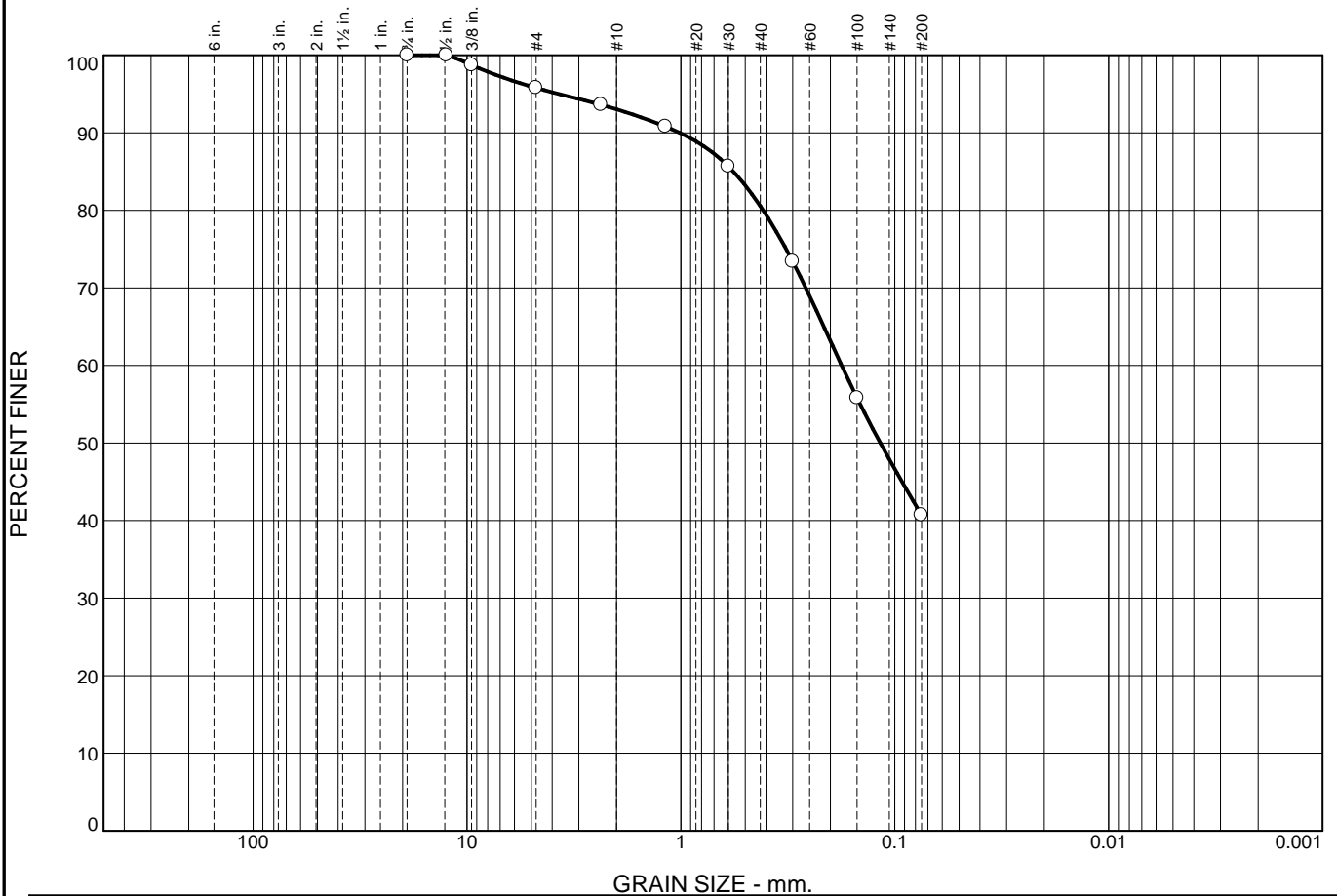
**Nova Engineering
& Environmental
Norcross, GA**

Client: H.J. Russell & Company
Project: James Brown Arena

Project No.: 2021003

Figure

Particle Size Distribution Report



%	#3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0.0	0.0	4.2	2.8	12.5	39.8	40.7			
×	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○			0.5680	0.1771	0.1168					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○			

Project No. 20201003 **Client:** H.J. Russell & Company
Project: James Brown Arena

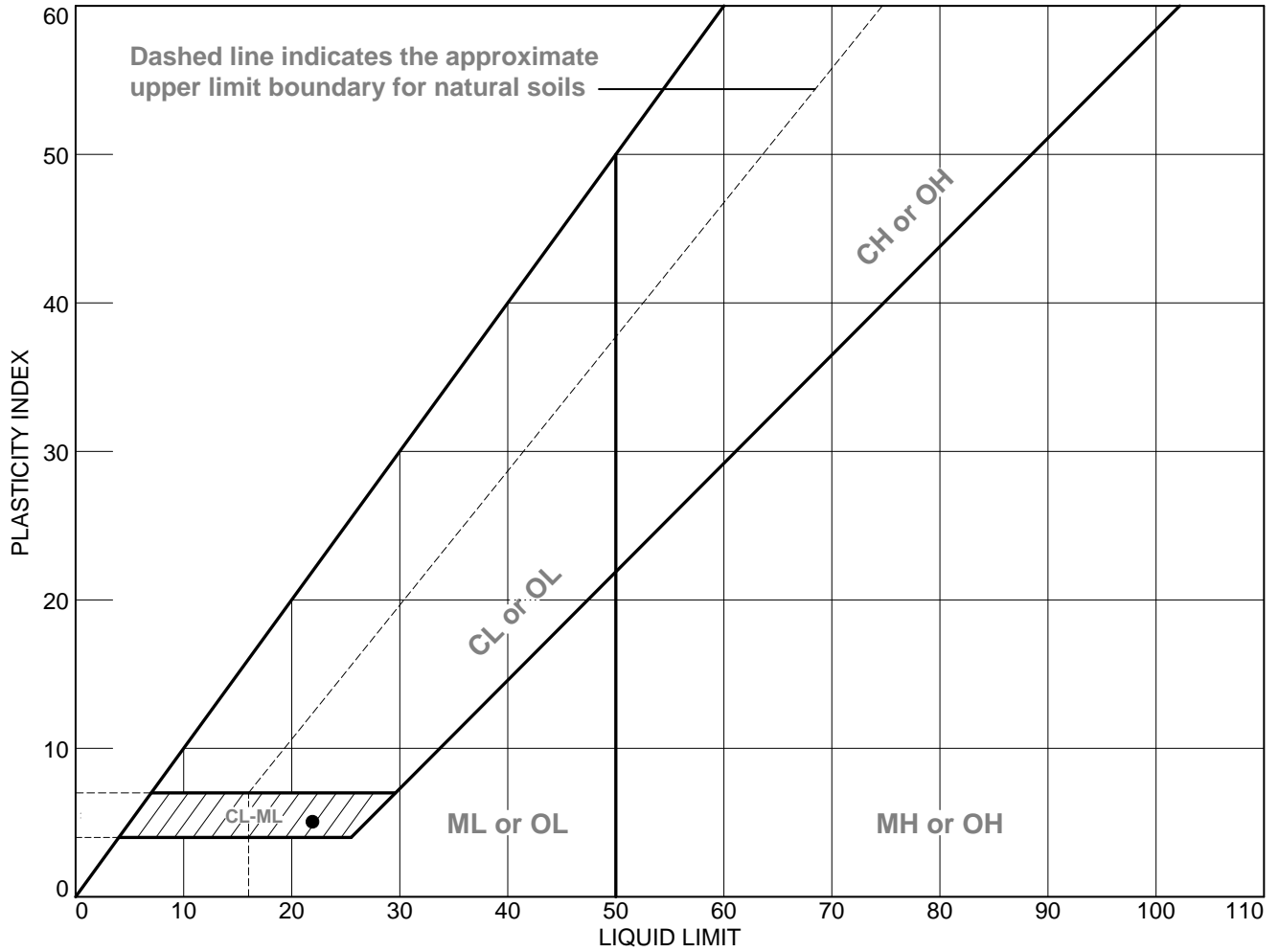
 ○ **Source of Sample:** B-16 **Sample Number:** P-02

Nova Engineering & Environmental
Norcross, GA

Remarks:

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-16	P-02		10.6	17	22	5	SC-SM

**Nova Engineering
& Environmental
Norcross, GA**

Client: H.J. Russell & Company
Project: James Brown Arena

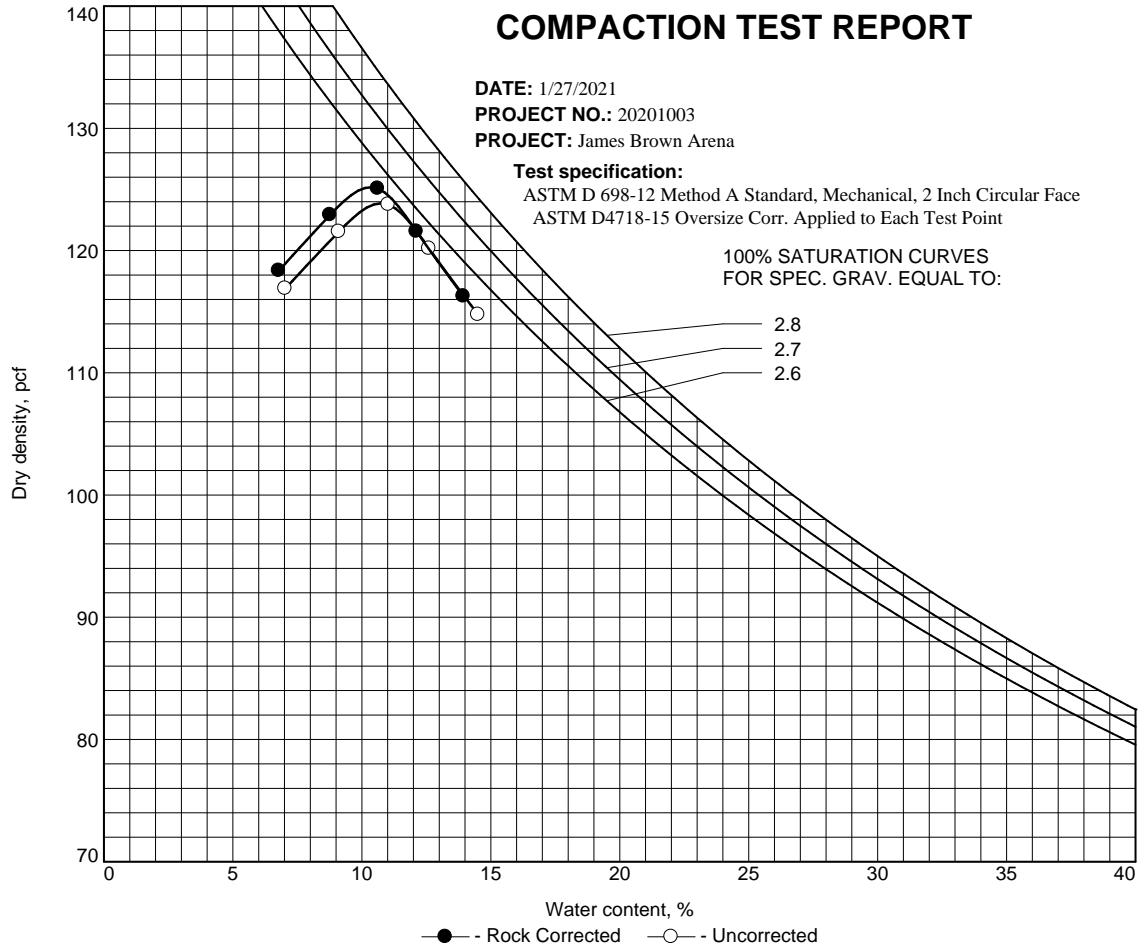
Project No.: 20201003

Figure

COMPACTION TEST REPORT

DATE: 1/27/2021
PROJECT NO.: 20201003
PROJECT: James Brown Arena

Test specification:
 ASTM D 698-12 Method A Standard, Mechanical, 2 Inch Circular Face
 ASTM D4718-15 Oversize Corr. Applied to Each Test Point



Sample No.	Elev. or Depth	Material Description	Specific Gravity	LL	PL	Oversize	% < #200
○ P-02		Red Brown Silty Clayey Sand with Trace Gravel		22	17	%>#4=4.2	40.7

Sample No.	P-02			
Natural water content, percent	10.6			
Optimum water content, percent	10.3			
Max dry density, pcf	125.2			

Remarks:	B-16	Project:	James Brown Arena	Project No.:	20201003
		Location:			
		Source:		B-16	
		Nova Engineering & Environmental			
		Norcross, GA			
Figure					



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Date

01/29/21

Checked By

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ASTM D 1883/AASHTO T193

Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils

Client Pr. #	2021003	Lab. PR. #	2104A-05-1
Pr. Name	James Brown Arena	S. Type	Remold
Sample ID	37084/B-16	Depth/Elev.	-
Location	-	Add. Info	-

Proctor Method Description

Compaction Procedure	D698	T99	Other	Max Dry Density, pcf	123.9
	x			Optimum Moisture Content, %	10.7

CBR Method Description & Test Data

Point #	1	Mass of material before separation on 3/4" sieve, g	NA
Specified Moisture Cont., %	10.7	Mass of material retained on 3/4" sieve, g	NA
Specified % Compaction	100.0	Mass of +3/4" material replaced by (+#4 to -3/4") portion, g	NA
Number of Layers	3	Replaced Portion, %	NA
Number of Blows per layer	NA		
Mold ID	507	Penetration Piston ID	123
Height of Sample before Soaking, in	4.583	Rammer Type (Effort)	STD Manual
Volume of Sample, ft ³	0.07500	Height of Drop, in	12
Mass of Mold, g	6966	Mass of Rammer, kg	2.5
Mass of Wet Soil & Mold, g	11634.0	Condition of Sample	Soaked
Mass of Wet Soil, g	4668	Soaking Duration	96 hr
Wet Density, pcf	137.2	Surcharge Load	10 lb
Dry Density before Soaking, pcf	124.0	Surcharge Press., psi	0.35
Dial Gage Reading before Soaking, in	0.132	Penetration Rate, in/min	0.05
Dial Gage Reading after Soaking, in	0.132	Balance ID	6/564/566
Swell of Sample, in	0.000	Load Cell ID	11
Swell of Sample, %	0.0	Oven ID	496/610/758
Height of Sample after Soaking, in	4.583	Penetration Machine ID	10
Dry Density after Soaking, pcf	124.1	Rammer ID	315
Mass of Sample & Mold after Soaking, g	11687.0	Material was compacted at around optimum moisture content of Provided Standard Proctor	
% Compaction	100.1		

Moisture Content

	Point 1		
	Before Comp.	After Comp.	After Soaking*
Mass of Wet Sample and Tare, g	526.3	442.8	830.5
Mass of Dry Sample and Tare, g	485.0	409.3	758.1
Mass of Tare, g	100.5	92.6	161.7
Moisture Content, %	10.7	10.6	12.1
Average Moisture Content, %	10.7		

* Portion of sample used for determination of moisture content after soaking and penetration:

Top 1 inch	Av. Representative
YES	NO

Load - Penetration Data

Point 1		
Penetration, in	Load, lb	Stress, psi
0.000	6	0.0
0.0250	150	48.0
0.0500	320	104.7
0.0750	506	166.7
0.1000	691	228.3
0.1250	850	281.3
0.1500	994	329.3
0.1750	1129	374.3
0.2000	1238	410.6
0.3000	1629	540.9
0.4000	1930	641.3
0.5000	2221	738.3



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Date: 01/29/21

Checked By: *IH*

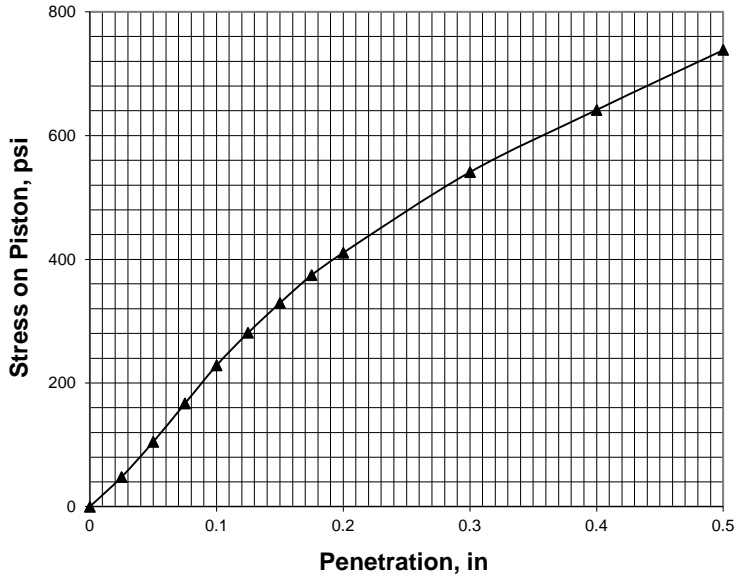
ASTM D 1883/AASHTO T193

Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils

Client Pr. #	2021003
Pr. Name	James Brown Arena
Sample ID	37084/B-16
Location	-

Lab. PR. #	2104A-05-1
S. Type	Remold
Depth/Elev.	-
Add. Info	-

LOAD-PENETRATION CURVE



	Corrected Penetration, in	Corrected Stress, psi	Bearing Ratio, %
Point 1	0.1	228.3	22.8
	0.2	410.6	27.4

DESCRIPTION

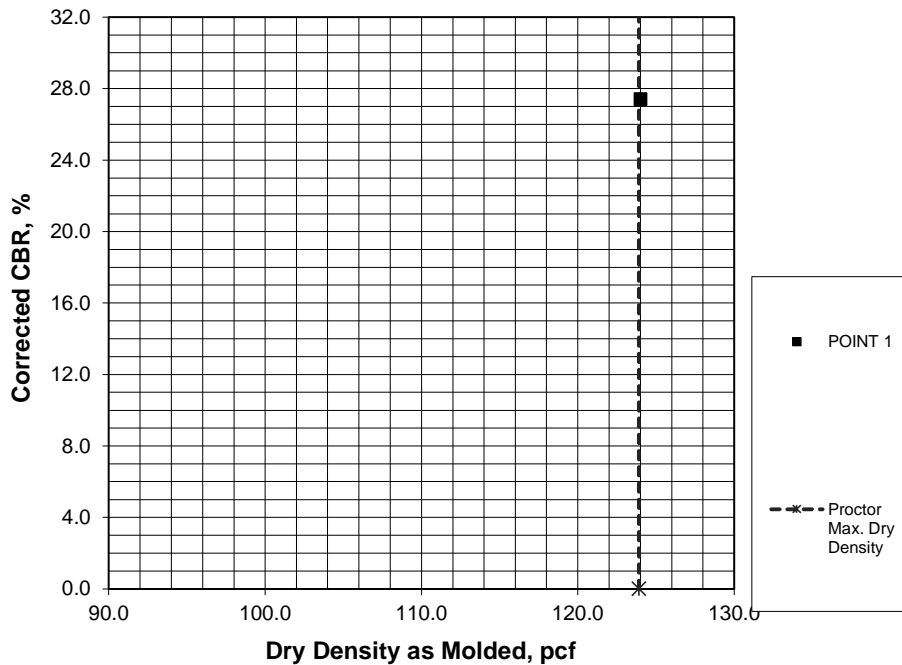
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USCS (ASTM D2487;2488)

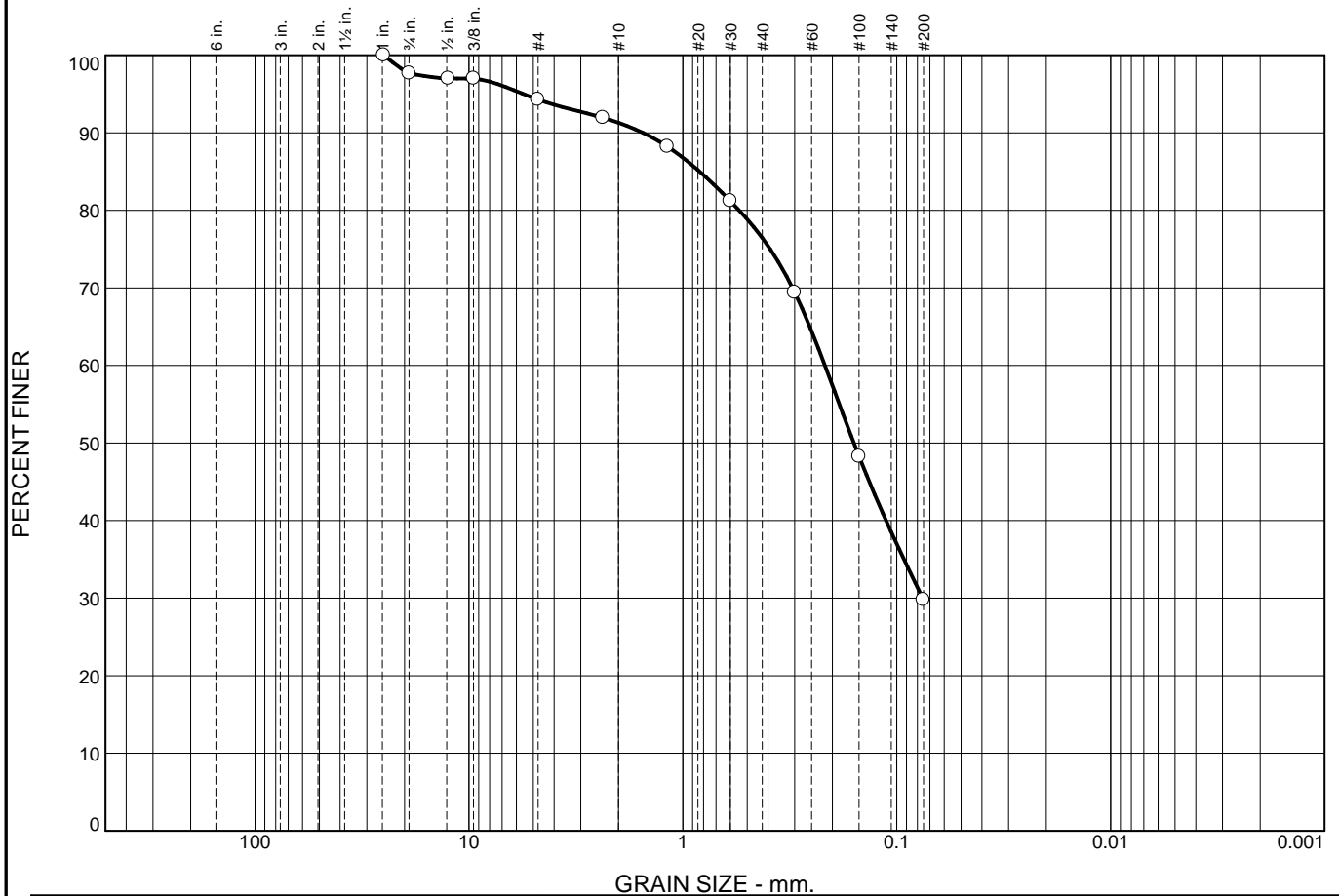
NA

Point #	Dry Density, pcf	Corrected CBR, %	Number of Blows per Layer
1	124.0	27.4	NA

DRY DENSITY vs. CBR



Particle Size Distribution Report



% +3"		% Gravel		% Sand			% Fines				
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			
0.0		2.3	3.4	3.0	14.9	46.6	29.8				
X LL		PL		D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
				0.8345	0.2167	0.1586	0.0757				

MATERIAL DESCRIPTION	TEST DATE	USCS	NM

Project No. 20201003 **Client:** H.J. Russell & Company
Project: James Brown Arena

 Source of Sample: B-17 **Sample Number:** P-03

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 Norcross, GA

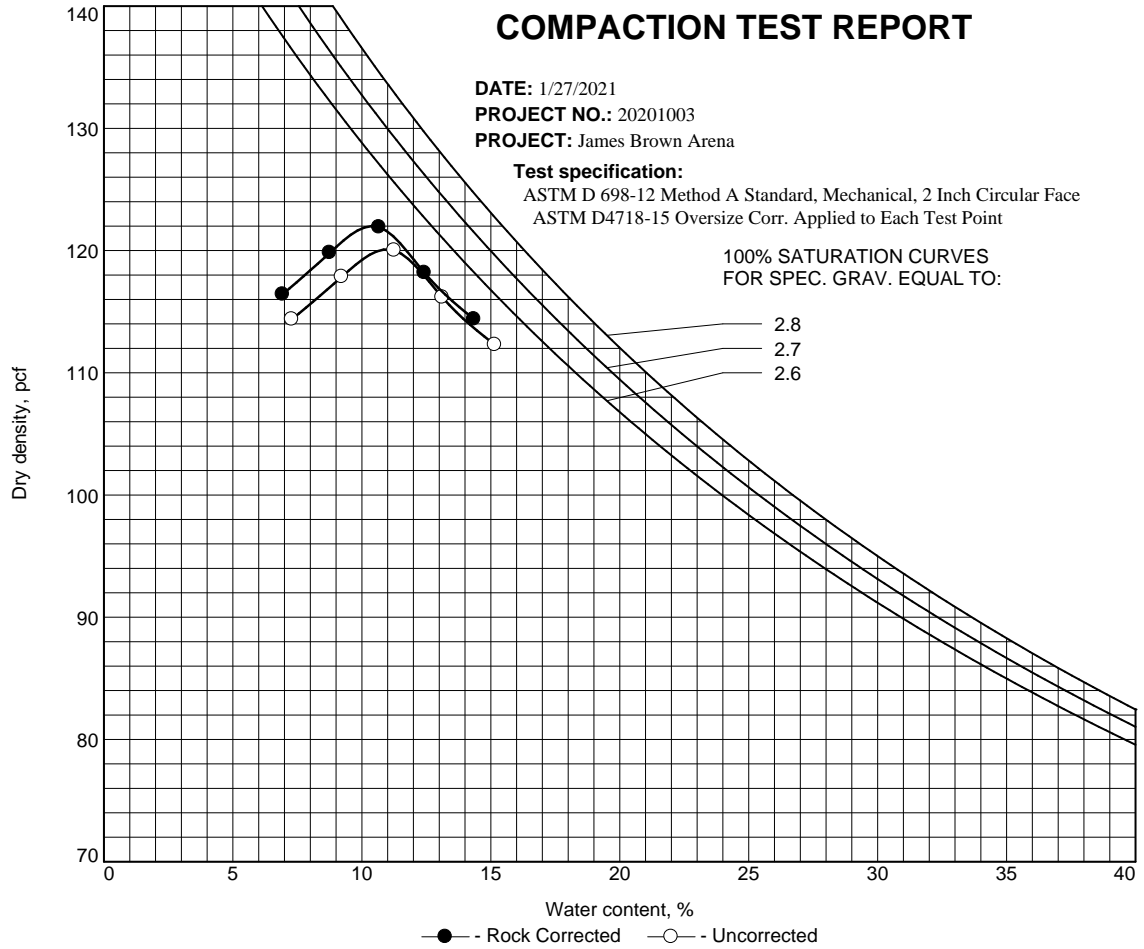
Remarks:
 B-17

Figure

COMPACTION TEST REPORT

DATE: 1/27/2021
PROJECT NO.: 20201003
PROJECT: James Brown Arena

Test specification:
 ASTM D 698-12 Method A Standard, Mechanical, 2 Inch Circular Face
 ASTM D4718-15 Oversize Corr. Applied to Each Test Point



Sample No.	Elev. or Depth	Material Description	Specific Gravity	LL	PL	Oversize	% < #200
○ P-03		Gray Brown Silty Sand		NV	NP	%>#4=5.7	29.8

Sample No.	P-03			
Natural water content, percent	11.2			
Optimum water content, percent	10.4			
Max dry density, pcf	122.0			

Remarks: B-17	Project: James Brown Arena	Project No.: 20201003
	Location:	
	Source:	B-17
	Nova Engineering & Environmental	
Figure	Norcross, GA	



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ASTM D 1883/AASHTO T193

Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils

Client Pr. #	2021003	Lab. PR. #	2104A-05-1
Pr. Name	James Brown Arena	S. Type	Remold
Sample ID	37085/B-17	Depth/Elev.	-
Location	-	Add. Info	-

Proctor Method Description

Compaction Procedure	D698	T99	Other	Max Dry Density, pcf	120.1
	x			Optimum Moisture Content, %	11.0

CBR Method Description & Test Data

Point #	1	Mass of material before separation on 3/4" sieve, g	NA
Specified Moisture Cont., %	11.0	Mass of material retained on 3/4" sieve, g	NA
Specified % Compaction	100.0	Mass of +3/4" material replaced by (+#4 to -3/4") portion, g	NA
Number of Layers	3	Replaced Portion, %	NA
Number of Blows per layer	NA		
Mold ID	508	Penetration Piston ID	123
Height of Sample before Soaking, in	4.582	Rammer Type (Effort)	STD Manual
Volume of Sample, ft ³	0.07500	Height of Drop, in	12
Mass of Mold, g	6865	Mass of Rammer, kg	2.5
Mass of Wet Soil & Mold, g	11400.0	Condition of Sample	Soaked
Mass of Wet Soil, g	4535	Soaking Duration	96 hr
Wet Density, pcf	133.3	Surcharge Load	10 lb
Dry Density before Soaking, pcf	120.0	Surcharge Press., psi	0.35
Dial Gage Reading before Soaking, in	0.228	Penetration Rate, in/min	0.05
Dial Gage Reading after Soaking, in	0.231	Balance ID	6/564/566
Swell of Sample, in	0.003	Load Cell ID	11
Swell of Sample, %	0.1	Oven ID	496/610/758
Height of Sample after Soaking, in	4.585	Dial Gage ID	450
Dry Density after Soaking, pcf	119.8	Rammer ID	315
Mass of Sample & Mold after Soaking, g	11459.0		
% Compaction	99.9		

Material was compacted at around optimum moisture content of Provided Standard Proctor

Moisture Content

	Point 1		
	Before Comp.	After Comp.	After Soaking*
Mass of Wet Sample and Tare, g	556.3	454.4	834.2
Mass of Dry Sample and Tare, g	511.6	417.5	757.3
Mass of Tare, g	105.0	86.7	159.1
Moisture Content, %	11.0	11.2	12.9
Average Moisture Content, %	11.1		

* Portion of sample used for determination of moisture content after soaking and penetration:

Top 1 inch	Av. Representative
YES	NO

Load - Penetration Data

Point 1		
Penetration, in	Load, lb	Stress, psi
0.000	8	0.0
0.0250	180	57.3
0.0500	380	124.0
0.0750	603	198.3
0.1000	828	273.3
0.1250	988	326.6
0.1500	1144	378.6
0.1750	1287	426.3
0.2000	1410	467.3
0.3000	1802	597.9
0.4000	1987	659.6
0.5000	2168	719.9



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Date: 01/29/21

Checked By: *[Signature]*

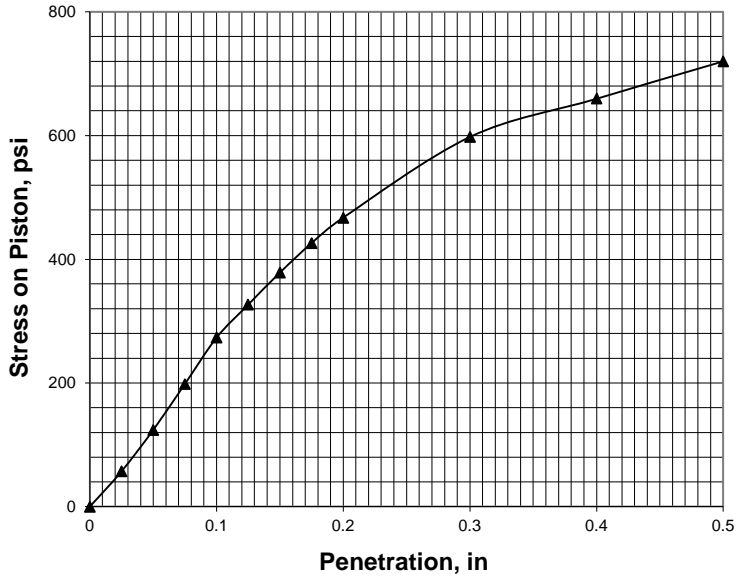
ASTM D 1883/AASHTO T193

Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils

Client Pr. #	2021003
Pr. Name	James Brown Arena
Sample ID	37085/B-17
Location	-

Lab. PR. #	2104A-05-1
S. Type	Remold
Depth/Elev.	-
Add. Info	-

LOAD-PENETRATION CURVE



▲ POINT 1

	Corrected Penetration, in	Corrected Stress, psi	Bearing Ratio, %
Point 1	0.1	273.3	27.3
	0.2	467.3	31.2

DESCRIPTION

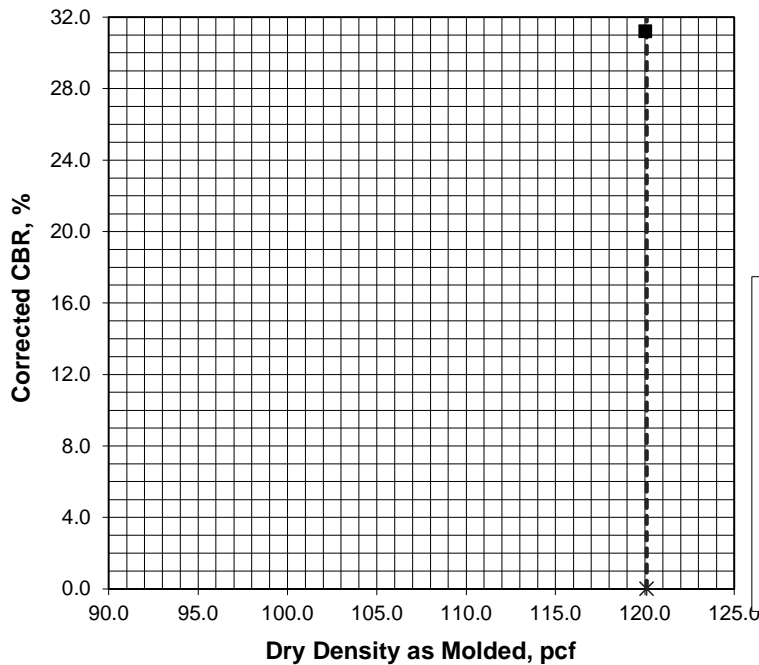
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USCS (ASTM D2487;2488)

NA

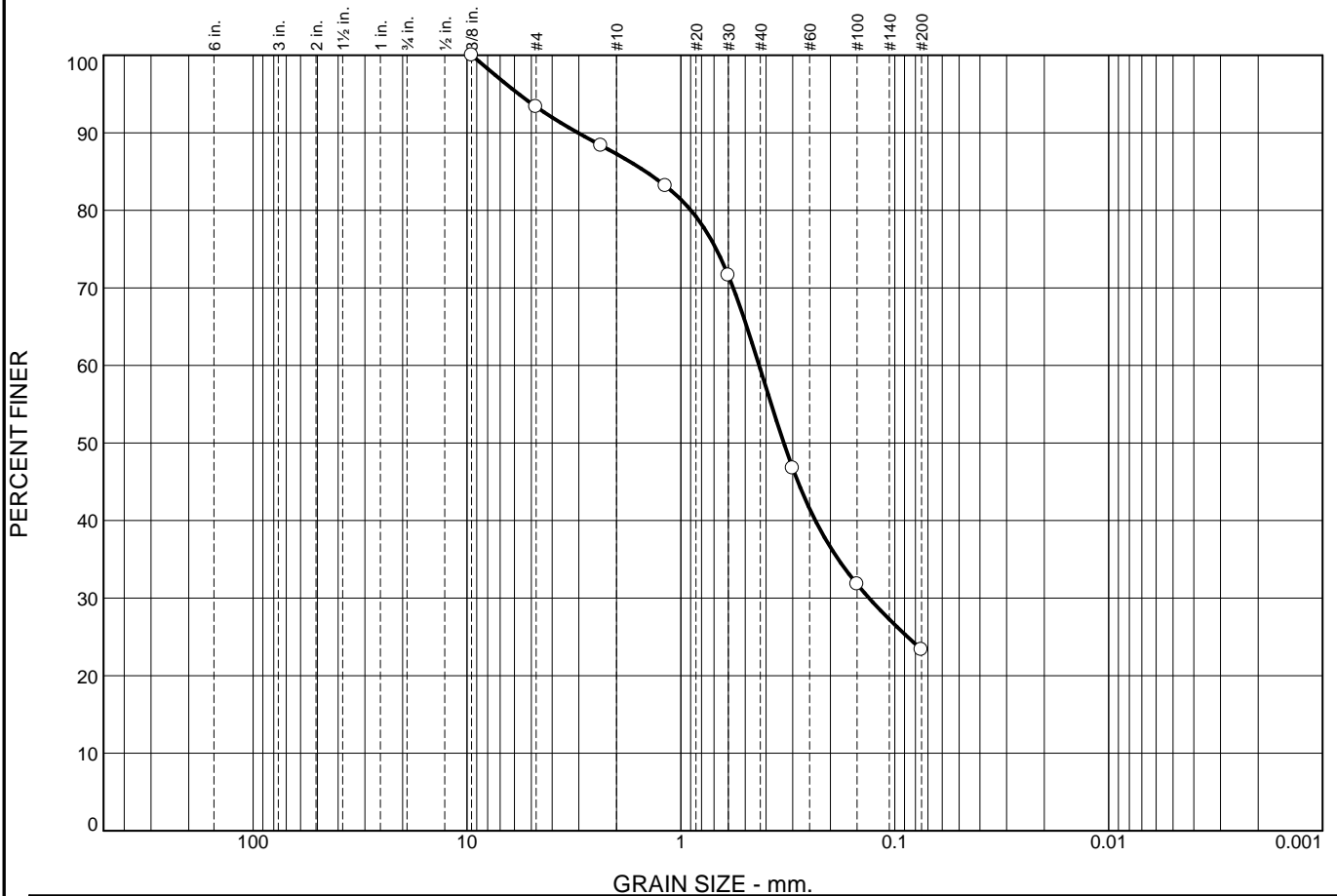
Point #	Dry Density, pcf	Corrected CBR, %	Number of Blows per Layer
1	120.0	31.2	NA

DRY DENSITY vs. CBR



■ POINT 1
 - - - Proctor Max. Dry Density

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.6	6.1	27.8	36.2	23.3	

LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
		1.4606	0.4305	0.3303	0.1318				

MATERIAL DESCRIPTION	TEST DATE	USCS	NM

Project No. 20201003 **Client:** H.J. Russell & Company
Project: James Brown Arena

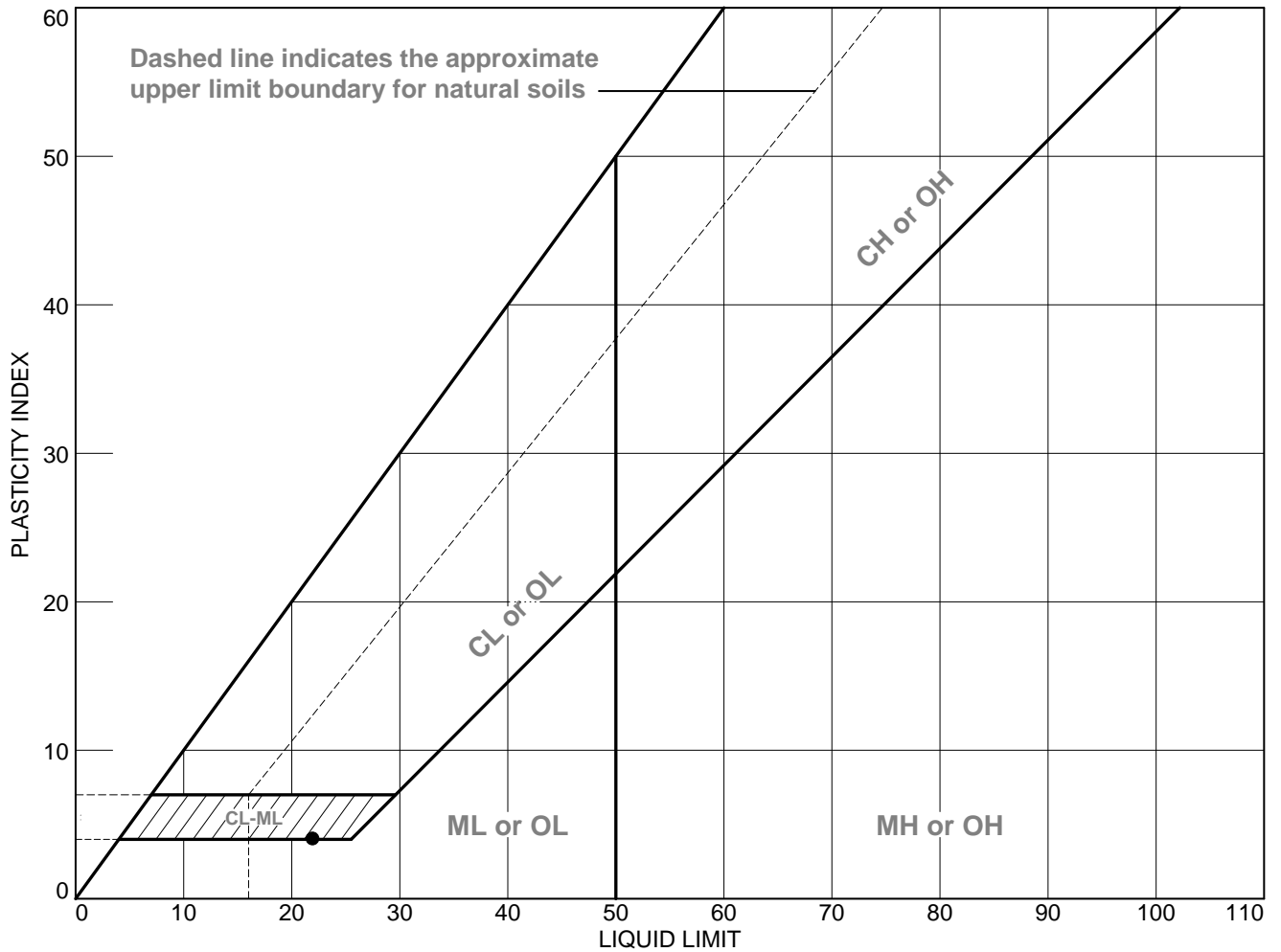
 Source of Sample: B-24 **Sample Number:** P-01

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Norcross, GA

Remarks:

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-24	P-01		10.7	18	22	4	SC-SM

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Norcross, GA**

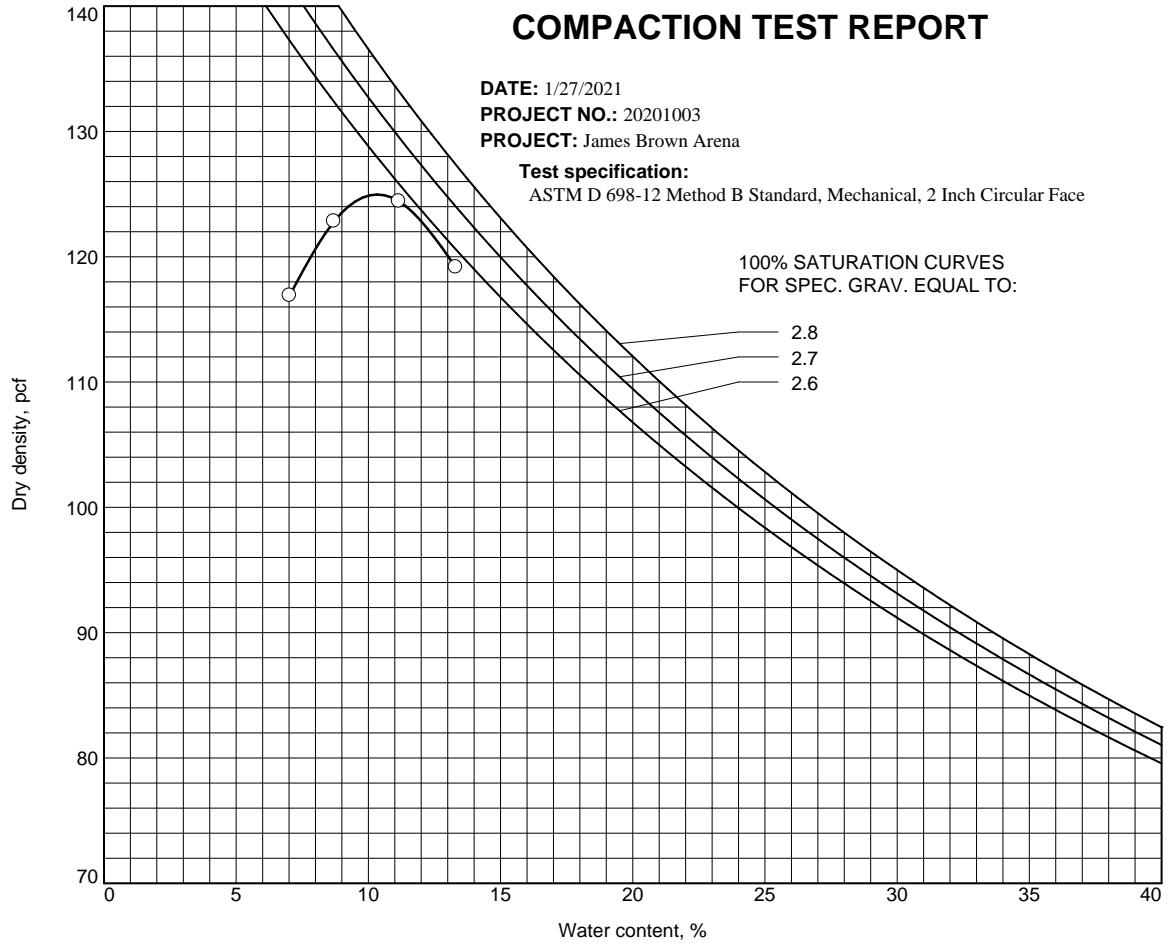
Client: H.J. Russell & Company
Project: James Brown Arena

Project No.: 20201003

Figure

COMPACTION TEST REPORT

DATE: 1/27/2021
PROJECT NO.: 20201003
PROJECT: James Brown Arena
Test specification:
 ASTM D 698-12 Method B Standard, Mechanical, 2 Inch Circular Face



Sample No.	Elev. or Depth	Material Description	Specific Gravity	LL	PL	Oversize	% < #200
○ P-01		Red Brown Silty Clayey Sand with trace Gravel		22	18	% > 3/8 in. = 0.0	23.3
Sample No.		P-01					
Natural water content, percent		10.7					
Optimum water content, percent		10.3					
Max dry density, pcf		125.0					
Remarks: B-24		Project: James Brown Arena			Project No.: 20201003		
		Location:					
		Source: B-24					
		Nova Engineering & Environmental					
Figure		Norcross, GA					



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ASTM D 1883/AASHTO T193

Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils

Client Pr. #	2021003	Lab. PR. #	2104A-05-1
Pr. Name	James Brown Arena	S. Type	Remold
Sample ID	37086/B-24	Depth/Elev.	-
Location	-	Add. Info	-

Proctor Method Description

Compaction Procedure	D698	T99	Other	Max Dry Density, pcf	125.0
	x			Optimum Moisture Content, %	10.3

CBR Method Description & Test Data

Point #	1	Mass of material before separation on 3/4" sieve, g	NA
Specified Moisture Cont., %	10.3	Mass of material retained on 3/4" sieve, g	NA
Specified % Compaction	100.0	Mass of +3/4" material replaced by (+#4 to -3/4") portion, g	NA
Number of Layers	3	Replaced Portion, %	NA
Number of Blows per layer	NA		
Mold ID	509	Penetration Piston ID	123
Height of Sample before Soaking, in	4.582	Rammer Type (Effort)	STD Manual
Volume of Sample, ft ³	0.07500	Height of Drop, in	12
Mass of Mold, g	6925	Mass of Rammer, kg	2.5
Mass of Wet Soil & Mold, g	11618.0	Condition of Sample	Soaked
Mass of Wet Soil, g	4693	Soaking Duration	96 hr
Wet Density, pcf	137.9	Surcharge Load	10 lb
Dry Density before Soaking, pcf	124.9	Surcharge Press., psi	0.35
Dial Gage Reading before Soaking, in	0.113	Penetration Rate, in/min	0.05
Dial Gage Reading after Soaking, in	0.174	Balance ID	6/564/566
Swell of Sample, in	0.061	Load Cell ID	11
Swell of Sample, %	1.3	Oven ID	496/610/758
Height of Sample after Soaking, in	4.643	Penetration Machine ID	10
Dry Density after Soaking, pcf	123.2	Rammer ID	315
Mass of Sample & Mold after Soaking, g	11648.0	Material was compacted at around optimum moisture content of Provided Standard Proctor	
% Compaction	100.0		

Moisture Content

	Point 1		
	Before Comp.	After Comp.	After Soaking*
Mass of Wet Sample and Tare, g	528.3	451.3	868.5
Mass of Dry Sample and Tare, g	489.5	418.0	800.2
Mass of Tare, g	115.0	99.5	207.4
Moisture Content, %	10.4	10.5	11.5
Average Moisture Content, %	10.4		

* Portion of sample used for determination of moisture content after soaking and penetration:

Top 1 inch	Av. Representative
YES	NO

Load - Penetration Data

Point 1		
Penetration, in	Load, lb	Stress, psi
0.000	6	0.0
0.0250	16	3.3
0.0500	59	17.7
0.0750	245	79.7
0.1000	466	153.3
0.1250	667	220.3
0.1500	845	279.6
0.1750	1001	331.6
0.2000	1136	376.6
0.3000	1614	535.9
0.4000	1986	659.9
0.5000	2291	761.6



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Date: 01/29/21

Checked By: *IH*

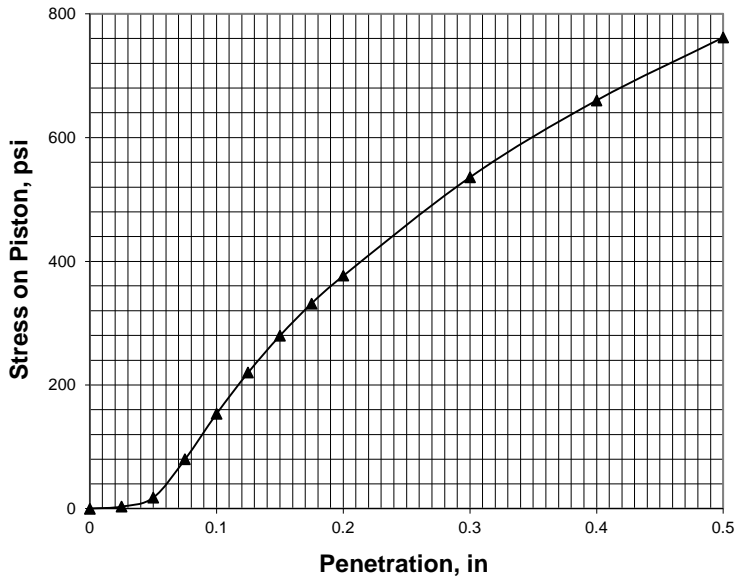
ASTM D 1883/AASHTO T193

Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils

Client Pr. #	2021003
Pr. Name	James Brown Arena
Sample ID	37086/B-24
Location	-

Lab. PR. #	2104A-05-1
S. Type	Remold
Depth/Elev.	-
Add. Info	-

LOAD-PENETRATION CURVE



	Corrected Penetration, in	Corrected Stress, psi	Bearing Ratio, %
Point 1	0.1	279.6	28.0
	0.2	460.6	30.7

DESCRIPTION

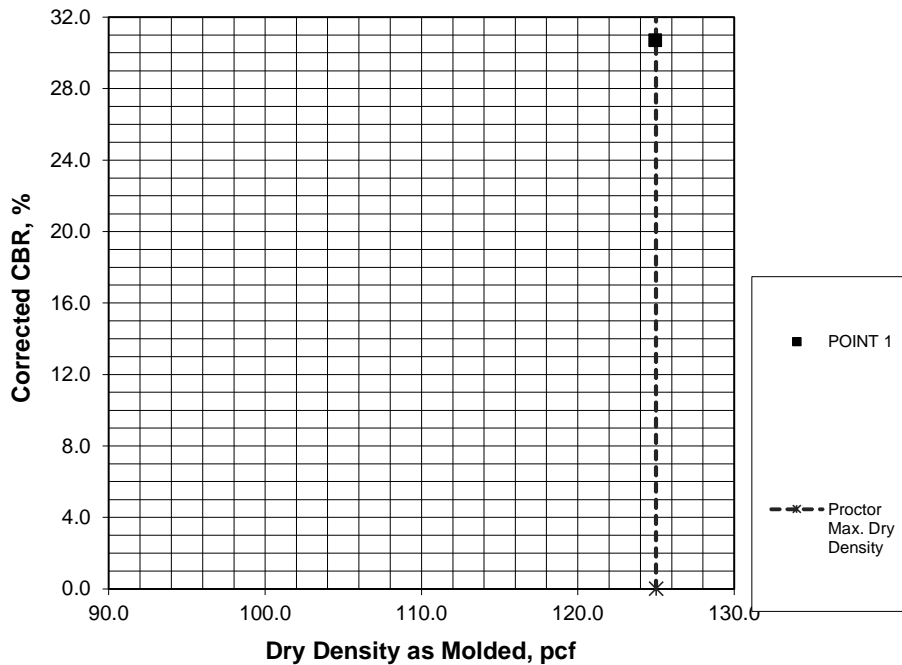
NA

USCS (ASTM D2487;2488)

NA

Point #	Dry Density, pcf	Corrected CBR, %	Number of Blows per Layer
1	124.9	30.7	NA

DRY DENSITY vs. CBR



APPENDIX D
Qualifications of Recommendations

QUALIFICATIONS OF RECOMMENDATIONS

The findings, conclusions and recommendations presented in this report represent our professional opinions concerning subsurface conditions at the site. The opinions presented are relative to the dates of our site work and should not be relied on to represent conditions at later dates or at locations not explored. The opinions included herein are based on information provided to us, the data obtained at specific locations during the study and our past experience. If additional information becomes available that might impact our geotechnical opinions, it will be necessary for NOVA to review the information, reassess the potential concerns, and re-evaluate our conclusions and recommendations.

Regardless of the thoroughness of a geotechnical exploration, there is the possibility that conditions between borings will differ from those encountered at specific boring locations, that conditions are not as anticipated by the designers and/or the contractors, or that either natural events or the construction process have altered the subsurface conditions. These variations are an inherent risk associated with subsurface conditions in this region and the approximate methods used to obtain the data. These variations may not be apparent until construction.

The professional opinions presented in this geotechnical report are not final. Field observations and foundation installation monitoring by the geotechnical engineer, as well as soil density testing and other quality assurance functions associated with site earthwork and foundation construction, are an extension of this report. Therefore, NOVA should be retained by the owner to observe all earthwork and foundation construction to document that the conditions anticipated in this study actually exist, and to finalize or amend our conclusions and recommendations. NOVA is not responsible or liable for the conclusions and recommendations presented in this report if NOVA does not perform these observation and testing services.

This report is intended for the sole use of the CLIENT only. The scope of work performed during this study was developed for purposes specifically intended by the CLIENT and may not satisfy other users' requirements. Use of this report or the findings, conclusions or recommendations by others will be at the sole risk of the user. NOVA is not responsible or liable for the interpretation by others of the data in this report, nor their conclusions, recommendations or opinions.

Our professional services have been performed, our findings obtained, our conclusions derived, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices in the State of Georgia. This warranty is in lieu of all other statements or warranties, either expressed or implied.

Important Information about This

Geotechnical-Engineering Report

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

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

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply this report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an

assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by:* the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help

others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold-prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical-engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your GBC-Member geotechnical engineer for more information.



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SECTION 01 10 00

SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Protection of persons, work, and property.
5. Coordination with occupants.
6. Work restrictions.
7. Specification and Drawing conventions.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: Bell Auditorium Expansion & Renovation.

1. Project Location: 712 Telfair St., Augusta, GA 30901.

B. Owner: Augusta-Richmond County Coliseum Authority.

1. Owner's Representative: HP Brantly.

C. Architect Identification: The Contract Documents were prepared for the Project by Perkins&Will, 475 Lincoln Street, Suite 100, Denver, CO 80203.

D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Refer to Drawing Title Page.

E. Construction Manager:

1. Construction Manager for this Project is Project's constructor. In Divisions 01 through 49 Sections, the terms "Construction Manager" and "Contractor" are synonymous.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Bell Theater Expansion and Interior Renovation, including selective demolition and new construction of dressing rooms, premium club room, restrooms, addition of elevator, landscaping, and other Work indicated in the Contract Documents.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.4 CONTRACTOR DUTIES

- A. VOC Compliance: Ensure that all assemblies, components, and systems comply with all VOC (Volatile Organic Components) requirements and regulations of the Environmental Protection Agency (EPA), Occupational Safety Health Administration (OSHA), State, County, City, and Local Air Control District.

1. See Divisions 02 through 28 for Project VOC Restrictions.

- B. Except as specifically noted, provide and pay for:

1. Labor, materials, and equipment.
2. Tools, construction equipment and machinery.
3. Water, heat, and utilities required for construction.
4. Other facilities and services necessary for proper execution and completion of work.

- C. Secure and pay for, as necessary for proper execution and completion of Work, and as applicable at time of receipt of bids:

1. Building Permit.
2. Licenses.

- D. Give required notices.

- E. Comply with all applicable local Building Codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of Work.

- F. Promptly submit written notice to Architect of observed variance of Contract Documents from requirements of authorities having jurisdiction. Assume responsibility for Work known to be contrary to code or regulatory requirements performed without such notice.

1.5 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section and by Owner's right to perform work or retain other contractors on portions of the project.

1. During construction, allow for Owner occupancy and public use of, and access to, existing facilities.
2. Make each entity engaged in work on the Project aware that the existing facilities house operating functions that must remain in operation during the construction period, except as the Owner may otherwise direct. Plumbing,

- heating, ventilating, electrical, fire alarm, and telephone systems are to be functional throughout the construction period with a minimum of interruptions in service. Do not block any required fire exits.
3. Confine operations at Project site to areas permitted by law, ordinances, permits, and Contract Documents.
 4. Do not unreasonably encumber site with materials or equipment that hinders access.
 5. Protect and keep safe products stored on premises.
 6. Products and materials are to be stored to not interfere with operations of Owner or other contractors.
 7. Obtain and pay for use of additional storage or work areas needed for operations.
- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Limit use of site for work and storage as follows:
 - a. Do not use completed paved areas for storage without Owner's approval.
 - b. Restrict Work and storage to areas indicated on Drawings or approved by Owner.
 - c. Limit site access to locations approved by Owner.
 - d. Restrict parking to areas approved by Owner.
 - e. Do not perform operations that would interrupt or delay Owner's daily
 2. Driveways, Walkways and Entrances: Keep driveways, parking garage, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment onsite.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.
- 1.6 PROTECTION OF PERSONS, WORK, AND PROPERTY
- A. Contractor shall maintain adequate protection of the Work from damage and shall protect the Owner's and adjacent property from injury or loss arising from the Work.
1. Repair damage to existing buildings, property, and site caused by employees, subcontractors, or consultants.

- B. Contractor shall provide and always maintain OSHA-required danger signs, guards, and obstructions necessary to protect the public and construction personnel from any dangers inherent with or created by the construction of the Work.
 - 1. Comply with federal, state, and city rules and requirements pertaining to safety, and all EPA standards, OSHA standards, and NESHAP regulations pertaining to asbestos and other hazardous materials.

1.7 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.8 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7 a.m. to 7 p.m., Monday through Friday, unless otherwise indicated.
 - 1. Hours for Core Drilling and other noisy activities: Coordinate with Owner. Perform during hours when building is least occupied.
 - 2. Obtain approval from Owner for work outside of these hours.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Construction Manager not less than 72 hours in advance of proposed utility interruptions.
 - 2. Obtain Construction Manager's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Construction Manager not less than 72 hours in advance of proposed disruptive operations.
 - 2. Obtain Construction Manager's written permission before proceeding with disruptive operations.

- E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.
- F. Nonsmoking Property: Smoking is not permitted within the building or on Owner's property.
- G. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.
- H. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specifications Format: The Specifications are organized into Divisions and Sections using CSI/CSC's "MasterFormat 2020" 50-Division numbering system.
 - 1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence, without all numbers included in the sequence. Consult the Table of Contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
 - 2. The order of articles, paragraphs, subparagraphs, and sub-subparagraphs within the text of any Specification section is defined by a sequence of indentations.
 - a. Article, paragraph and subparagraph titles, and other identifications of subject matter in the Specifications, are intended as an aid in locating and recognizing various requirements in the beginning words of a sentence.
 - b. Specification text shall govern over titling and shall be understood to be interpreted as a whole. Where a title establishes the subject, the titles are subordinate to and do not define, limit, or otherwise restrict the Specification text.
 - 3. The captions and headings of various subdivisions of the Contract Documents are intended only as a matter of reference and convenience for describing the Work and in no way define, prescribe, or limit the scope or intent of the Contract Documents or any subdivision thereof.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood

- may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
- a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - b. Contract Documents may omit modifying words such as "all" or "any," and articles such as "the" or "an." The absence of a modifier or article from one statement that appears in another is not intended to affect the interpretation of either statement.
3. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
 4. The Specifications do not:
 - a. Establish trade jurisdictions or divisions of responsibility.
 - b. Define subcontract scopes of work.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. Work specified in any one Section is related to, and dependent upon, Work specified in other Sections, whether or not specific reference is made to the Work of other Sections. Cross-references in the Specifications are general references intended as a matter of convenience for aiding in the location general information and are not all-inclusive.
- E. Names, telephone numbers, and website addresses and other contact information listed in the Contract Documents are for convenience only, are subject to change, and are believed to be accurate and up to date as of the printing of the Contract Documents.
- F. Use of the word "including," when following any general statement, shall not be construed to limit such statement to specific items or matters listed, whether or not non-limiting language (such as "without limitation," "but not limited to," or other words of similar import) is used with reference thereto; but rather, shall be deemed to refer to all other items or matters that could reasonably fall within the broadest possible scope of such general statement.
- G. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 13 00

DELEGATED DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for assemblies and construction systems provided by the Contractor as delegated design.

1.2 DEFINITIONS

- A. Delegated: Means delegated by the Owner and Architect to the Contractor.
- B. Design: Means the planning, coordination, and graphic and written communication of a portion of the Work, including determination and engineering of system or assembly or system organization and structure, in response to functional requirements, arrangement and performance criteria indicated in the Contract Documents.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Portions of the Contract Documents delegate the design of certain components, assemblies or systems to the Contractor, or may otherwise specify "delegated design requirements" in individual specification Sections.
- B. The Contractor is to be responsible for delegated design Work, including design, engineering and performance.
- C. Drawings of delegated design portions of Work are diagrammatic and are intended only to show:
 - 1. Design intent of finished materials, profiles, shapes and forms.
 - 2. Relationships between elements.
 - 3. Location, identification, dimension and size of components, assemblies and accessories.
 - 4. Schematic attachment details and diagrams of fasteners and connections.
- D. Specifications for delegated design portions of the Work establish performance criteria for materials, products, systems, and methods of execution, along with minimum performance requirements for indicated portions of the Work.
- E. The Architect will review informational submittals specified herein to determine whether or not the delegated component, assembly or system design complies with the following.
 - 1. That the Contractor's engineering shows substantiation of the specified performance criteria.
 - 2. Conforms to specified performance requirements, including those subsequent modifications.

3. Complies with the overall project design.
 4. Can be appropriately integrated into the overall design of the project.
 5. Review by the Architect does not relieve the Contractor from compliance with the requirements of the delegated component.
- F. In the event of conflicts regarding the Contractor's proposed delegated design solutions and the design intent of the Contract Documents, the decision of the Architect will be final.

1.4 PROCEDURAL REQUIREMENTS

- A. Design Requirements: Proposed delegated design solutions are to demonstrate compliance with the original design intent of the Contract Documents, as determined by the Architect.
1. Unless otherwise defined by the Contract Documents, appearance of exposed elements, including member sizes, profiles and alignment of components, are to be within dimensional limits of section profiles indicated on the Drawings, and are to be consistent throughout the Project. Do not deviate from profiles, layouts or arrangements indicated without prior written approval from the Architect.
 2. Proposed delegated design solutions that exactly follow details indicated on the Drawings do not relieve Contractor of responsibility for design and performance of delegated design portions of Work.
- B. Engineering Requirements: Engineer delegated design portions of the Work to meet or exceed specified performance requirements, to satisfy the requirements of the authorities having jurisdiction, and to provide structurally sound, water and weathertight assemblies capable of withstanding the specified in-service loads without failure.
- C. Additional Requirements:
1. Fabricate, assemble and install delegated design portions of the Work to accommodate the full range of manufacturing, operating and field installation tolerances of adjacent work specified in other Sections.
 2. If required by the authorities having jurisdiction, submit shop drawings, specifications, calculations and other supporting data necessary for obtaining jurisdiction approval after they have been reviewed by the Architect and prior to beginning installation. Pay fees incurred.

1.5 INFORMATIONAL SUBMITTALS

- A. General: Coordinate and process submittals for delegated design portion of Work in same manner as for other portions of Work.
- B. Design Data:
1. Submit engineering calculations demonstrating compliance with the requirements of Contract Documents and of the authorities having jurisdiction.
 - a. Provide calculations legible and that incorporate sufficient cross-references to shop drawings to make calculations readily understandable and reviewable.
 - b. Test reports are not acceptable as a substitute for calculations.

2. Structural Calculations: Include the following:
 - a. Analysis of framing members.
 - b. Section property computations for framing members.
 - c. Analysis of anchors, including anchors embedded in concrete
 - d. Signature and seal of the qualified Engineer responsible for their preparation.
- C. Furnish appropriate certification from licensed fabricator shop or complete detailed inspection reports signed by each inspector performing unlicensed shop inspection to the Architect before the Work affected by these inspections is delivered to the site.

1.6 QUALITY ASSURANCE

- A. Engineer Qualifications: Unless stated otherwise in other sections, provide the following:
 1. Professional Engineer legally licensed and qualified to practice in the State of Georgia and experienced in and having a minimum of 10 consecutive years providing the type of engineering services indicated in the Contract Documents.
 2. Engineering services are defined as those performed for the design, fabrication and installation of components and assemblies similar in material, design, complexity and extent to those indicated in the Contract Documents for this Project.
- B. Fabricator/Installer Qualifications: Firm with a minimum of 10 consecutive years' experience in the design, testing, fabrication, assembly, installation and coordination of specified components, assemblies and systems on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance. Submit evidence demonstrating the following:
 1. The ability to coordinate and work with a qualified testing agency for testing exterior building envelope assemblies utilizing the recognized test standards of the industry on projects similar in material, design, complexity and extent of this Project.
 2. The experience in managing, scheduling, coordinating, and maintaining on-time performance in conjunction with the successful projects and for the proposed project.
 3. An in-place, comprehensive quality assurance and quality control program and procedures that demonstrates how it is being applied on the project. Describe and demonstrate how the proposed comprehensive quality assurance and quality control program has been successful on other projects.
 4. The current resources, including currently employed personnel, to produce the Work to the specified requirements.
 5. The ability to produce proposal drawings, accommodate plant visits, and mockups, organization plans, project management plans and proposed schedules in conjunction with the bidding for this Project.
 6. The ability to warranty curtain wall systems for 5 years and the curtain wall finishes for 20 years.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide products, materials, components and accessories required for a complete installation and operation in the proposed design, whether or not such items are indicated in the Contract Documents.
- B. Provide anchors, attachments, hardware, inserts, fasteners, clips, bracing, framework, and similar items as required to meet specified design and performance requirements, and to anchor delegated design Work to adjacent supports, or to related adjoining work, whether or not such items are indicated in the Contract Documents.

PART 3 - EXECUTION

3.1 DESIGN

- A. Unless otherwise indicated or specified, maintain design intent and specified performance requirements of the Contract Documents.
 - 1. If certain fabrication or erection methods, minor dimensional changes and detailing adjustments to the original design in the Contract Documents are required, indicate such on submitted Shop Drawings.
 - 2. Prior to shop drawing submittal, obtain written approval from the Architect for proposed changes and adjustments.
- B. Engage a qualified Engineer to design connection details and determine fastener types and sizes.
 - 1. Fasteners or connections are not to conflict with or require revision to the design profiles indicated on the Drawings or to the supporting work.
 - 2. Connections are not to impose eccentric loading, nor induce twisting or warping to supporting structure.
 - 3. Design connections to accommodate potential and actual misalignment of adjacent work within tolerances specified in other Sections.

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for submitting and processing requests for product substitutions after the award of the construction contract.
- B. Related Requirements:
 - 1. Section 01 26 00 "Contract Modification Procedures" for determining which modification method and forms are appropriate.
 - 2. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

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

1.3 ACTION SUBMITTALS

- A. Substitution Requests: Electronically submit a PDF copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use form provided at the end of this Section.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product, fabrication, or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as

- performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from model code organization acceptable to the authorities having jurisdiction.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- B. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
1. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 2. Acceptance, if granted, will be based on reliance upon data submitted and the opinion, knowledge, information, and belief of the Architect at the time decision is rendered. Approval therefore is interim in nature and subject to reevaluation and reconsideration as additional data, materials, workmanship, and coordination with other work are observed and reviewed.
 3. In proposing items for consideration, Contractor assumes all risk, costs, and responsibility for item's final acceptance, compliance with Contract Documents, integration into the Work, and performance.
 4. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.
- B. A Substitution Request for products, assemblies, and equipment constitutes a representation that the Contractor:
 - 1. Has investigated the proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Has confirmed that the proposed substitution does not affect dimensions or functional clearances.
 - 3. Agrees to provide the same warranty for the substitution as for the specified product.
 - 4. Agrees to coordinate installation and make changes to other work that may be required for no additional cost to the Owner.
 - 5. Waives claims for additional costs or time extension that may subsequently become apparent.

1.5 PROCEDURES

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

1.6 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Requested substitution provides sustainable design characteristics that specified product provided.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is

uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

- B. Substitutions for Convenience: Not allowed.

1.7 ATTACHMENTS

- A. Post-Award Substitution Request Form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SUBSTITUTION REQUEST FORM
(For use after Procurement phase)

TO: Perkins&Will
475 Lincoln Street, Suite 100
Denver, CO 80203

From: _____

Substitution Request No: _____ DATE: _____

Contractor hereby requests acceptance of the following product or system as a substitution in accordance with provisions of Division 01 Section "Substitution Procedures:"

PROJECT SPECIFICATION

Specification Name/Number: _____
Article, Paragraph, Page Number: _____
Item/System to be Substituted: _____

REASON FOR SUBSTITUTION REQUEST

SPECIFIED PRODUCT . . .

- Is no longer available.
- Is unable to meet project schedule.
- Is unsuitable for the designated application.
- Cannot interface with adjacent materials.
- Is not compatible with adjacent materials.
- Cannot provide the specified warranty.
- Cannot be constructed as indicated.
- Other: _____
- Cannot be obtained due to one or more of the following:

- Strike
- Bankruptcy of manufacturer or supplier
- Lockout
- Similar occurrence

PROPOSED PRODUCT . . .

- Will reduce the Contract Time
by _____ days.
- Will reduce the Contract Sum
by \$ _____.
- Is an Owner-initiated substitution

Explanation of each item marked above (attach documentation):

EFFECT OF SUBSTITUTION

Proposed substitution affects other work or trades: No Yes (if yes, explain)

Proposed substitution requires dimensional revisions or redesign of architectural, structural, mechanical, electrical, plumbing, life safety, or other work:

No Yes (if yes, attach data explaining revisions)

PRODUCT COMPARISON

Provide side-by-side comparison between proposed substitution and specified product to facilitate review of Substitution Request:

SPECIFIED PRODUCT:

PROPOSED PRODUCT:

Manufacturer: _____

Name / Brand: _____

Catalog No.: _____

Supplier: _____

Features: _____

Variations: _____

(Attach additional sheets if necessary)

(Attach additional sheets if necessary)

Local Distributor or Supplier: _____

Manufacturer's Representative: _____

Maintenance Service Available: Yes No

Spare Parts Source and Location: _____

Warranty Available is equivalent to the specified warranty: Yes No _____ Years

Describe any variation from specified warranty: _____

Product Manufacturing History New 2-5 yrs 6-10 yrs More than 10 yrs old

SUPPORTING DATA ATTACHED (REQUIRED WHERE APPLICABLE)

Point-by-point comparison of performance criteria, materials, and components of specified product with proposed substitution.

Drawings Specifications Product Data Samples

Tests Reports LEED Compliance Warranty

REFERENCED INSTALLATIONS

Identify at least **three** similar local projects on which proposed substitution was used:

PROJECT #1:

Project: _____ **Date Installed:** _____

Address: _____

Owner: _____

Contact: _____ **Telephone:** _____

Architect: _____

Contact: _____ **Telephone:** _____

Contractor: _____

Contact: _____ **Telephone:** _____

PROJECT #2:

Project: _____ **Date Installed:** _____

Address: _____

Owner: _____

Contact: _____ **Telephone:** _____

Architect: _____

Contact: _____ **Telephone:** _____

Contractor: _____

Contact: _____ **Telephone:** _____

PROJECT #3:

Project: _____ **Date Installed:** _____

Address: _____

Owner: _____

Contact: _____ **Telephone:** _____

Architect: _____

Contact: _____ **Telephone:** _____

Contractor: _____

Contact: _____ **Telephone:** _____

ACKNOWLEDGEMENTS: The undersigned certify that:

- **Performance:** Proposed substitution has been fully investigated and determined to be equal or superior in all respects to the specified product, including appearance, quality, performance, code compliance, and sustainability compliance.
- **Warranty:** Same warranty will be furnished for proposed substitution as for specified product.
- **LEED Compliance (LEED projects only):** Same contribution to LEED program.
- **Operations and Maintenance:** Same maintenance service and source of replacement parts, as applicable, are available locally for the proposed substitution.
- **No Adverse Effect:** Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- **No Adverse Time or Cost:** Cost data and time as stated above are complete. Contractor bears all costs for labor and materials associated with fully integrating proposed substitution into the Project. Claims for additional costs or time related to accepted substitution which may subsequently become apparent are waived.
 - Payment will be made to the Owner for changes to the project design, including Architect's and Engineer's redesign fees and engineering, detailing, special inspection, and construction costs incurred by the Owner caused by acceptance of the substitution.
 - Coordination necessary to fully integrate the proposed substitution, and any associated modifications to related or adjacent Work, have been or will be performed.
- **Dimensions and Clearances:** Proposed substitution does not affect dimensions or functional clearances.
- **Conditions of Acceptance:** The Architect's recommendation for approval, if granted, relies on data submitted and the opinion and knowledge of the Architect at the time decision is rendered. The approval is conditional in nature and subject to reevaluation and reconsideration if additional data or materials are submitted, or coordination with other work is observed to invalidate claims that substitution is equal to item originally specified.

Contractor: _____
(Name of Contractor)

Date: _____ By: _____

Subcontractor: _____
(Name of Subcontractor)

Date: _____ By: _____

Note: *Substitution requests are not part of the standard submittal process and shall not be submitted as part of Shop Drawings, Product Data, or Samples submittals. Substitution requests must be filled out completely. Unresponsive or incomplete requests will be rejected and returned without review.*

ARCHITECT'S REVIEW AND ACTION

- Substitution acceptance is recommended.
- Substitution acceptance is recommended, with the following comments: _____

- Architect's additional services proposal attached.
- Resubmit Substitution Request:
 - Provide the following: _____
 - Provide proposal indicating amount of savings / credit to Owner
- Substitution acceptance is not recommended:
 - Substitution Request received too late.
 - Substitution Request received directly from subcontractor or supplier.
 - Substitution Request not submitted in accordance with requirements.
 - Substitution Request Form is not properly executed.
 - Substitution Request does not indicate what item is being proposed.
 - Insufficient information submitted to facilitate proper evaluation.
 - Proposed product does not appear to comply with specified requirements.
 - Design Team has no experience with product / manufacturer and is therefore unable to comment on the track record of quality, performance, or reliability.
 - Proposed product will require substantial revisions to Contract Documents.

PERKINS&WILL

Perkins&Will acknowledges its reliance upon information provided by the Contractor, and makes no claim as to the accuracy, completeness, or validity of such information. If an accepted substitution is later found to not comply with requirements of the Contract Documents, the Contractor shall be solely responsible for performance of the work in accordance with requirements of the Contract Documents.

By: _____ Date: _____

OWNER'S REVIEW AND ACTION

- Substitution is accepted; Architect to prepare Change Order.
- Substitution is not accepted.

By accepting this substitution, Owner agrees to compensate Perkins+Will for additional services, if any, necessary to implement the substitution.

Additional Services: \$ _____

By: _____ Date: _____

(Owner's Representative)

END OF FORM

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.
- B. Related Requirements:
 - 1. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
 - 2. Section 01 31 00 "Project Management and Coordination for Requests for Interpretation" for administrative procedures for handling RFIs.

1.2 MINOR CHANGES IN THE WORK

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

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Construction Manager will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Construction Manager are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Contractor's Action: Within 10 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include separate costs of labor, materials, equipment 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 Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Construction Manager.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include separate costs of labor, materials, equipment and supervision directly attributable to the change.
 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 7. Proposal Request Form: Use form acceptable to Architect.

1.4 CHANGE ORDER PROCEDURES

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

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect or Construction Manager 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 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Requests for Information (RFIs).
 - 4. Digital project management procedures.
 - 5. Project meetings.
- B. Related Requirements:
 - 1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.
 - 4. Section 01 91 13 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.2 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information required for clarifications of the Contract Documents.
- C. PIMS: Web-based Project Information Management System managed by the Contractor and for use by Owner, Owner's Consultants, Architect and Architect's Consultants.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
 4. Post list on PIMS and always keep current.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
1. Post copies of list in project meeting room, in temporary field office, on PIMS and in prominent location in built facility. Always keep list current.
- C. Administrative and Personnel: In addition to Project superintendent, identify other administrative and supervisory personnel as required for proper performance of the Work. Identify individuals and their duties and responsibilities; list their addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
1. Include personnel required for coordination of operations with other contractors.
- D. Coordination Drawings:
1. Contractor's stamped, dated and approved Coordination Drawings.
 - a. Retain on site, transmittals and one copy of Contractor's Coordination Drawings.
- 1.4 GENERAL COORDINATION PROCEDURES
- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
 4. Where availability of space is limited, coordinate installation of components to ensure maximum performance and accessibility for required maintenance, service, and repair of components, including mechanical and electrical.
- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work.

- C. Conservation: Coordinate construction activities to ensure operations are carried out with consideration given to conservation of energy, water, and materials.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 COORDINATION DRAWINGS

- A. Coordination Meetings: Conduct coordination meetings with subcontractors. Owner and Architect may or may not be present at such meetings.
 - 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 time a minimum of three days prior to the meeting date.
- B. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
- C. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
- D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
 - 1. File Preparation and Submittal Format: Same digital data software program, version, and operating system as original Drawings.
 - 2. BIM File Incorporation: Develop and incorporate coordination drawing files into BIM established for Project.
 - a. Perform three-dimensional component conflict analysis as part of the preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification for design requirements by Architect.
 - 3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Contractor shall execute a data licensing agreement in the form of Electronic File Transfer Agreement included in this Project Manual or a Digital Execution Plan agreed to by the Owner, Contractor and Architect.

1.6 REQUEST FOR INFORMATION (RFI)

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

1. Contractor shall submit RFIs to Architect using PIMS.
 2. Architect shall provide Contractor with a list of design team contacts by discipline for RFI distribution.
 3. Concurrent with submission to the Architect, Contractor shall also distribute RFIs to appropriate design team professionals, using PIMS, based on the disciplines affected by the RFI.
 4. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 5. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
 6. Include only one subject or item per RFI. RFIs that include more than one subject or item will be returned without review to the Contractor.
- B. Contractor's failure to report discrepancies or omissions in the Contract Documents, or Contractor- or Subcontractor-generated assumptions, in lieu of Architect-issued clarifications regarding the intent of the Contract Documents, shall not be used as a basis for future claims once the apparent discrepancies or omissions have been reconciled by appropriate interpretation issued by the Architect.
- C. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. RFI subject or item.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- D. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

1. Attachments shall be electronic files in PDF format.

E. RFI Submission Procedure:

1. Post electronic submittals as PDF electronic files directly to the Contractor's PIMS as described below.

F. Architect's Action: Architect will review each RFI, determine action required, and respond as indicated in the project General Conditions. Allow seven working days for Architect's response for each RFI.

1. RFIs received by Architect after 1:00 p.m. in Architect's time zone will be considered as received the following working day.

2. Where the due date for an action or response occurs on a Saturday, Sunday, or legal holiday, such action or response shall be considered due on the next day that is not a Saturday, Sunday, or legal holiday.

3. The following RFIs will be returned without action:

- a. RFIs addressing more than one subject or item.
- b. Requests for approval of submittals.
- c. Requests for approval of substitutions.
- d. Requests for approval of Contractor's means and methods.
- e. Requests for approval of nonconforming Work.
- f. Requests for coordination information already indicated in the Contract Documents.
- g. Requests for adjustments in the Contract Time or the Contract Sum.
- h. Requests for interpretation of Architect's actions on submittals.
- i. Incomplete RFIs or inaccurately prepared RFIs.

4. Architect's action may include a request for additional information, in which case Architect's time for response will begin at the time of receipt by Architect of additional information.

5. RFIs involving requests for recommendations or design assistance on how to address remediation or correction of nonconforming work are not eligible for an increase in Contract Sum or an extension of Contract Time, regardless of when the RFIs are returned, or the corrective action proposed therein.

6. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "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.

1) If Contractor's notification is submitted more than 21 days after receipt of the RFI response, any work resulting from the RFI response is not eligible for an increase in Contract Sum or an extension of Contract Time.

7. In the event Contractor requests an accelerated RFI review and response by Architect, Architect will endeavor to accommodate Contractor's request. However, any such desired accelerated review times shall not supersede the requirements of the Contract, and no extension of Contract Time will be authorized because of Architect's failure or inability to adhere to Contractor's desired accelerated review times.

8. Architect will return a response to the RFI via the PIMS.
- G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date the RFI response is due.
 8. List of parties the RFI was distributed to.
 9. Date Architect's response was received.
 10. Date the RFI was closed by the Contractor.
 11. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
- H. 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.

1.7 DIGITAL PROJECT INFORMATION MANAGEMENT

- A. Use of Architect's Digital Data Files: Digital data files of Architect's BIM model will be provided by Architect for Contractor's use during construction.
1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 3. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual.
- B. Web-Based Project Information System (PIMS): Provide, administer, and use web-based Project software for purposes of hosting and managing Project communication and documentation until Final Completion.
1. PIMS shall be similar to Procore, Ebuilder, Autodesk Construction Cloud or Plangrid but shall include, at a minimum, the following features:
 - a. Project Directory, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
 - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
 - c. Document workflow planning, allowing customization of workflow between project entities.

- d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
 - e. Track status of each Project communication in real time, and log time and date when responses are provided.
 - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
 - g. Processing and tracking of payment applications.
 - h. Processing and tracking of contract modifications.
 - i. Creating and distributing meeting minutes.
 - j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
 - k. Management of construction progress photographs.
 - l. Mobile device compatibility, including smartphones and tablets.
 - m. Creating and exporting editable logs for all PIMS functions including, but not limited to: RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders. Owner, Architect and Architect's Consultants shall have rights and ability to download logs at any time.
2. Provide up to 20 user licenses for use of Owner, Owner's Commissioning Authority, Architect, and Architect's consultants. Provide eight hours of software training at Architect's office for web-based Project software users.
 3. At completion of Project, change of PIMS or end of Owner-Contractor Contract, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
- C. PDF Document Preparation:
1. Assemble each RFI package into a single indexed file incorporating all information required in this section.
 2. Assemble each submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form.
 3. Name file with a unique identifier, including revision identifier.
 4. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.
- 1.8 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 time a minimum of 5 days prior to the meeting date.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees using PIMS.

3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes using PIMS to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect progress, including but not limited to the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Digital Execution Plan and associated procedures.
 - m. Preparation of record documents.
 - n. Use of the premises and existing building.
 - o. Work restrictions.
 - p. Working hours.
 - q. Owner's occupancy requirements.
 - r. Responsibility for temporary facilities and controls.
 - s. Procedures for moisture and mold control.
 - t. Procedures for disruptions and shutdowns.
 - u. Construction waste management and recycling.
 - v. Parking availability.
 - w. Office, work, and storage areas.
 - x. Equipment deliveries and priorities.
 - y. First aid.
 - z. Security.
 - aa. Progress cleaning.
 - bb. Special procedural, inspection and submittal requirements of the Authorities Having Jurisdiction.
 4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes using PIMS.

- C. Digital Execution Conference: schedule and conduct a digital execution conference before starting construction, at a time convenient to Owner Architect, and Contractor.
1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent and; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect the exchange of digital information, including but not limited to the following:
 - a. Electronic file transfer requirements and protocols.
 - b. Right of reliance on Architect's and Architect's Consultants digital files.
 - c. Schedule of digital file transfers and periodic updates.
 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes using PIMS.
- D. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity as indicated in individual Sections.
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, and Owner's Commissioning Authority of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - 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 other parties requiring information using PIMS.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- E. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
- 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 - 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including but not limited to the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for completing design documentation.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for delivery of material samples, attic stock, and spare parts.
 - g. Requirements for demonstration and training.
 - h. Preparation of Contractor's punch list.
 - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - j. Submittal procedures.
 - k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.
 - n. Close of PIMS and export of data to Owner and Architect.
 - 4. Minutes: Entity conducting meeting will record and distribute meeting minutes using PIMS.
- F. Progress Meetings: Conduct progress meetings at regular intervals.
- 1. Coordinate dates of meetings with preparation of payment requests.
 - 2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination,

or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Status of design documentation.
 - 6) Deliveries.
 - 7) Off-site fabrication.
 - 8) Access.
 - 9) Site utilization.
 - 10) Temporary facilities and controls.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) Status of RFIs.
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information using PIMS.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Concealed Work photographs.
 - 3. Periodic construction photographs.
 - 4. Final Completion construction photographs.
- B. Related Requirements:
 - 1. Section 01 33 00 "Submittal Procedures" for submitting photographic documentation.
 - 2. Section 01 77 00 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
 - 3. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Construction photographs may not be used for Contractor's marketing materials or social media unless approved by Owner.

1.3 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
 - 1. Submit photos electronically. Include copy of key plan indicating each photograph's location and direction.
 - 2. Identification: Provide the following information with each image description in web-based Project management software site:
 - a. Name of Project.
 - b. Name of Contractor.
 - c. Date photograph was taken.
 - d. Description of location, vantage point, and direction.
 - e. Unique sequential identifier keyed to accompanying key plan.

1.4 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format. Photographs should be clear, free from obstruction with appropriate lighting, and easily viewable.
- B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1.5 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs with maximum depth of field and in focus.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
 - 1. Flag construction limits before taking construction photographs.
 - 2. Take photographs to show existing conditions adjacent to property before starting the Work.
 - 3. Take photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
 - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- C. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:
 - 1. Underground utilities.
 - 2. Underslab services.
 - 3. Piping.
 - 4. Electrical conduit.
 - 5. Waterproofing and weather-resistant barriers.
- D. Periodic Construction Photographs: Take photographs at weekly intervals [coinciding with the cutoff date associated with each Application for Payment]. Select vantage points to show status of construction and progress since last photographs were taken.
- E. Final Completion Construction Photographs: Take photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.
- F. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.
 - 1. Three days' notice will be given, where feasible.

2. In emergency situations, take additional photographs within 24 hours of request.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 01 31 00 "Project Management and Coordination"; for submitting RFIs, issuing meeting minutes, and submitting Coordination Drawings requirements.
 - 2. Section 01 32 33 "Photographic Documentation" for submitting construction photographs.
 - 3. Section 01 40 00 "Quality Requirements" for submitting test and inspection reports.
 - 4. Section 01 77 00 "Closeout Procedures" for submitting warranties.
 - 5. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 6. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 7. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

- A. Submittals: Written and graphic information and physical samples.
- B. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users can access files.
- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- 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. Submit submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of 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. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 10 business 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 10 business days for review of each resubmittal.
- C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with a unique identifier:
 - a. Specification number with no spaces followed by a period.
 - b. Three-digit sequential number followed by a period.
 - c. Two-digit revision number followed by a dash. An initial submittal will use 00 for the revision number.
 - d. Two-character Type Identifier followed by a dash.
 - 1) CT for certificate.
 - 2) IN for informational submittal.
 - 3) PD for product data.
 - 4) QL for qualification information.
 - 5) SA for samples.
 - 6) SD for shop drawing.
 - 7) TR for test report.
 - e. Short description of the content, using material designation indicated in the Contract Documents where present.
 - f. Example: 084413.001.00-SD-Curtain Wall CW-1.pdf
 3. Use submittal schedule to permanently record Contractor's review and approval markings and action taken by Architect and Owner.
 4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner.
- D. Options: Identify options requiring selection by the Architect and Owner.

- E. Deviations: Identify deviations from the Contract Documents on submittals.
 - 1. Clearly identify deviations from the Contract Documents by clouding or other suitable means acceptable to Architect and Owner.
 - a. Provide accompanying detailed written explanation for each deviation.
 - b. Provide the corresponding specification Section labeled with compliance and non-compliance.
- F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- G. 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.
- H. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Post electronic submittals as PDF electronic files directly to FTP site specifically established for Project as agreed to by Architect and Owner.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - 3. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Equipment dimensional drawings.
 - b. Wiring diagrams showing factory-installed wiring.
 - c. Printed performance curves.
 - d. Operational range diagrams.
 - e. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data concurrent with Samples.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based upon Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 3. Number and title of applicable Specification Section.
 4. Number of Samples: Submit samples as required in individual Specification Sections.
 5. Disposition: When possible, maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of

- construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
- a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the responsibility of Contractor.
- E. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."
 - F. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
 - G. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.
 - H. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 - I. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
 - J. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
 - K. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
 - L. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
 - M. Product Test Reports: Submit 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.
 - N. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
 - O. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
 - P. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

- Q. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- R. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and paper copies of certificate if required, 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.
- C. BIM File Incorporation: Incorporate delegated-design drawing and data files into Building Information Model established for Project.
- D. Provide delegated-design drawings to Owner in electronic format.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Section 01 77 00 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. 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.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are not acceptable, will be considered non-responsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

3.3 ATTACHMENTS

- A. Appendix A – Electronic Drawing File Transfer Agreement Form.
- B. Appendix B – Submittal Transmittal Form.

END OF SECTION

Electronic File Transfer Agreement (Contractor – BIM Files)

Name	Date:	[Publish Date]
Address	Project Name:	Bell Auditorium Expansion & Renovations
Description of Data:	Project No:	222028.000

The undersigned is a contractor (the “Contractor”) performing services and/or directly or indirectly providing goods and material related to the subject project (the “Project”). The undersigned hereby requests that Perkins&Will and its consultants provide electronic files prepared by Perkins&Will and its consultants for the Project in the form of an electronic model (the “Model Files”). The undersigned acknowledges and agrees that Perkins&Will has no contractual obligation, or any other obligation, to provide the Model Files to the contractor. Perkins&Will agrees to provide the Model Files in consideration for the undertakings of the undersigned. The undersigned agrees that the Contract Documents that Perkins&Will is contractually obligated to prepare and/or deliver are hardcopy drawings and specifications only. The undersigned additionally agrees that the Model Files are not Contract Documents (as that term is defined in or understood to mean in the Owner-Contractor Agreement), do not represent Contract Document modifications, and are not intended to be a substitute for or a supplement to the hardcopy drawings and specifications, or to necessarily represent actual physical conditions on the Project site.

Model Files to be furnished include work prepared by Perkins&Will and its consultant(s) only. The Model Files were prepared by Perkins&Will using the Autodesk® Revit® software platform. Model Files will be furnished in that software platform’s standard format without modifications for the Contractor’s convenience. One set of electronic Model Files will be furnished to the Contractor. The Contractor assumes responsibility for distributing pertinent files to the subcontractors.

The undersigned agrees that the request to provide the Model Files is purely for the convenience of the undersigned and does not constitute the rendering of professional services. Perkins&Will has prepared the Model Files to facilitate the production of the Contract Documents, which are reasonably accurate and complete to the extent of the standard of professional care. The undersigned acknowledges that Perkins&Will does not represent the furnished Model Files as being accurate or complete, as being suitable for the Contractor’s purpose, or as identifying or containing any issue, anomaly, omission, or concern with reference to the Project.

The undersigned agrees and understands that the Model Files, except as expressly set forth above, are not fit for any particular purpose, including but not limited to quantity take-offs; pricing; clash detection; ascertainment of construction or installation tolerances and clearances; preparation of shop drawings, coordination drawings, or fabrication drawings; construction sequencing; or the manufacture of any building component or system. As such, the Model Files, and the information contained in them, and the information that may have been omitted from them, shall not be used as a basis for an increase in the Contract Sum or Contract Time.

The undersigned acknowledges that the Model Files have not necessarily been developed with the assistance or specific expertise of the individual subcontractors and installers, and therefore do not

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account for or incorporate means and methods required by individual subcontractors for their scope of the finished Work. Modifications to the information about the components included in the Model Files may be required and are the responsibility of the Contractor to ascertain, coordinate, and implement. All such modifications are part of the scope of Work of this Project and shall be provided at no additional cost to Owner.

The undersigned further acknowledges that Perkins&Will has made no representations to the undersigned that the Model Files are suitable for any purpose other than as expressly set forth above, or will be usable by the undersigned's systems, infrastructure, or software. The undersigned also understands and agrees that the Model Files may be subject to anomalies, errors, viruses, malware, or other unintended defects, and that Perkins&Will has not reviewed or determined whether such defects may be present in any electronic files. Use of these electronic files is solely at the risk of the undersigned.

The undersigned agrees to release any and all claims that they may have at any time against Perkins&Will or its consultants arising out of the use of the Model Files by the undersigned or by any other individual or entity. The undersigned agrees to hold harmless and indemnify Perkins&Will and its consultants from and against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees arising from or in any way connected with the provision of the Model Files by Perkins&Will or the use, modification, misinterpretation, misuse, or reuse by others of the Model Files provided by Perkins&Will. The undersigned shall not use, modify, or reproduce any of the Model Files without first removing identifying information for Perkins&Will and its consultants that may be incorporated in the furnished Model Files.

The undersigned confirms that it will use the Model Files only with reference to the Project and shall not copy or distribute the Model Files, or permit the Model Files to be copied or distributed by others, except for use on this Project. The undersigned shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms and conditions of this Agreement, and to assume toward the Contractor all the obligations and responsibilities that the Contractor, by this Agreement, assumes toward the Owner and Perkins&Will. The undersigned Contractor assumes responsibility for the breach of this Agreement by any Subcontractor to whom the Contractor distributes the Model Files.

Upon return receipt of this signed Agreement, the Model Files will be transmitted to the undersigned through electronic mail, or be posted on the Perkins&Will file transfer protocol site or the Project web site.

This Agreement may be executed in counterpart, and the parties agree that the individual counterparts, taken together, shall constitute a binding agreement.

The undersigned agrees that they are authorized to bind the company indicated below to the obligations of this Agreement, and understands that Perkins&Will is relying upon this representation in agreeing to enter into this Agreement. In addition to any rights that Perkins&Will may have against the company, the undersigned agrees that Perkins&Will shall have rights personally against the undersigned if this apparent authority is questioned or disputed by the company in any way.

The undersigned agrees that any violation of this Agreement by the undersigned or the company, or any of the agents, representatives, officers, or employees of either, will result in irreparable harm to Perkins&Will that cannot be entirely compensated by money damages. Therefore, the undersigned and the company agree that Perkins&Will may seek any and all equitable remedies that may be available to Perkins&Will, including but not limited to a temporary or permanent injunction in the event of any breach or threatened breach of the terms of this Agreement.

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The undersigned shall reimburse Perkins&Will for any cost or expense, including attorney's fees and all labor and expenses (including those of in-house counsel), related to the enforcement of the terms of this Agreement.

Perkins&Will

Acknowledged and Accepted

Signature

Signature of Recipient

Name

Name

Title

Company

Date

Title

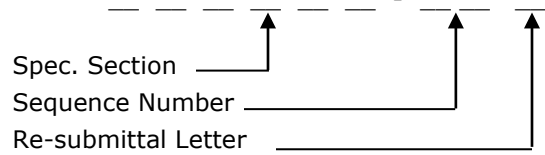
END OF AGREEMENT

SUBMITTAL TRANSMITTAL

SUBMITTAL NUMBER:

PROJECT: Bell Auditorium
Expansion & Renovation

P&W Proj. No: 222028.000



SPECIFICATION SECTION:

Number: _____

Title: _____

DESCRIPTION OF PRODUCT:

NOTES:

1. Submittal Transmittal to Architect indicates Construction Manager's, Contractor's, and Subcontractor's Approval of Submittal.
2. This Transmittal Form shall stay with Submittal throughout routing. Copy for your file.

Check here if LEED Submittal

ROUTING SEQUENCE	CHECKED BY	DATE REC'D.	DATE SENT	No. of COPIES	ACTION TAKEN*
SUBCONTRACTOR OR VENDOR		N/A			A (See Note 1 above)
CONTRACTOR					A (See Note 1 above)
ARCHITECT					
CONSULTANT					
ARCHITECT					
CONTRACTOR					
SUBCONTRACTOR OR VENDOR			N/A		
OWNER	N/A		N/A		N/A

ACTION LEGEND: (*Indicate in ACTION TAKEN column above.)

- | | |
|-------------------------|---|
| A - NO EXCEPTIONS | E - FOR INFORMATION ONLY |
| B - EXCEPTIONS AS NOTED | F - NOT REVIEWED |
| C - REVISE AND RESUBMIT | 1 Submittal is not required. |
| D - REJECTED | 2 Submittal was not reviewed by Contractor. |

REMARKS:

- [] SEE ATTACHED COMMENTS [] SEE ENCLOSED SUBMITTAL FOR COMMENTS
- [] LANGUAGE ON CONTRACTOR'S SUBMITTAL STAMP IS NOT CONSISTENT WITH CONTRACT REQUIREMENTS

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Specific test and inspection requirements are not specified in this Section.
- C. Related Requirements:
 - 1. Section 01 43 39 "Mockup Requirements" for mockup requirements.
 - 2. Section 01 45 29 "Structural Testing and Inspections" for administrative and procedural requirements for special inspections.
 - 3. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.

- C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- D. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.
- E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- G. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

1.3 CONFLICTING REQUIREMENTS

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

1.4 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- D. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit 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, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
- C. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- D. Monitoring and Documentation: Maintain inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

- A. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, and telephone number of technical representative making report.

2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- B. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.
- 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.

1.8 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance. Where required by individual Specification Sections, Installer employing workers trained and approved by manufacturer, Installer being

acceptable to manufacturer, and/or Installer being an authorized representative of manufacturer for both installation and maintenance.

- 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 in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and engaged in the activities indicated.
 - 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. When testing is complete, remove assemblies; do not reuse materials on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- J. Mockups: Refer to Section 01 43 19 and individual sections of the Specifications for mockup requirements.

1.9 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
 3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction.
 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

- F. 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.
- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Submit schedule within 30 days of date established for commencement of the Work. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect, Commissioning Authority, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

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

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

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 42 00

REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract, without any implied meaning extending the Architect's responsibility into the Contractor's area of Contractor coordination, supervision, or means and methods of construction as outlined in the Conditions of the Contract.
 - 1. In no situation will an approval by Architect release Contractor from responsibility to fulfill requirements of the Contract Documents.
- C. "Authorities Having Jurisdiction" (AHJ): Means the agencies, either individually or collectively, charged by statute with administration and enforcement of the requirements of building codes and other regulations at the Project location.
- D. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- E. "General Requirements":
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions (if any) and other Division 01 General Requirement Sections, apply to all sections of the work.
 - 2. The provisions or requirements of Division 01 Sections apply to entire Work of the Contract and where so indicated, to other elements which are included in the Project.
- F. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- G. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- H. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- I. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- J. "Provide": Furnish and install, complete and ready for the intended use.

- K. "Installer": Means the Contractor or other entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor to perform a particular construction operation at the Project site, including preparation, erection, installation, application, construction, re-installation, and similar operations required for execution of the Work.
1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
 2. 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 trades people of the corresponding generic name.
- L. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation

may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits.

2. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Architect for a decision before proceeding.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 43 39
MOCKUP REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for constructing mockups.
- B. Related Sections include the following:
 - 1. Section 01 40 00 "Quality Requirements" for administrative requirements pertaining to project quality assurance.
 - 2. Divisions 02 through 33 Sections for specific material mockups unique to individual work results.

1.2 DEFINITIONS

- A. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1.3 ACTION SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Coordinate with trades affected in completion of required mockups at location designated by Owner.
- B. Complete each item or system of the mockup by the tradesmen who will provide the actual work.
- C. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.

2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
- D. Use the same installation methods and materials as required for the Work. Schedule construction so that it may be reviewed, and any necessary adjustments made, prior to commencing fabrication of the Work. When accepted, mock-up shall serve as the standard for materials, workmanship, and appearance throughout the Project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 014523

SPECIAL INSPECTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. This Section specifies administrative and procedural requirements for Special Inspections.

1.2 SUMMARY

- A. The following documents form a part of this Section and follow this page:
1. 'Statement of Special Inspections', ACECSEAOG SI- GL 01-12. (1 page)
 2. 'Statement of Special Inspections Requirements for Seismic Resistance' (1 page)
 3. 'Statement of Special Inspections Requirements for Wind Resistance' (1 page)
 4. 'Schedule of Special Inspection Services', ACEC/SEAOG SI GL 01-12B. (11 pages)

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION 01 45 29

STATEMENT OF SPECIAL INSPECTIONS

PROJECT NUMBER AND TITLE: BELL AUDITORIUM EXPANSION AND RENOVATIONS

LOCATION: 712 TELFAIR STREET, AUGUSTA, GA 30901

ARCHITECT OF RECORD: PERKINS & WILL

STRUCTURAL ENGINEER OF RECORD: SYKES CONSULTING

MECHANICAL ENGINEER OF RECORD: M-E ENGINEERS

ELECTRICAL ENGINEER OF RECORD: M-E ENGINEERS

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: DARIEN SYKES, PE, SE

This Statement of Special Inspections is submitted in accordance with Section 1704.3 of the 2018 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 *Special Inspections for Seismic Resistance* and/or *Special Inspections for Wind Resistance*.

Are *Special Inspections for Seismic Resistance* included in the *Statement of Special Inspections*? Yes No
Are *Special Inspections 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 GSFIC and to the Registered Design Professional in Responsible Charge at a frequency agreed upon by the Design Professional and GSFIC 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 GSFIC and the Registered Design Professional in Responsible Charge prior to completion 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 GSFIC and the Registered Design Professional in Responsible Charge at the conclusion of the project.

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

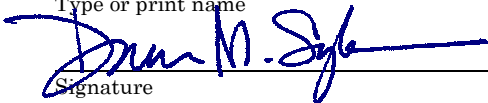
Weekly Bi-Weekly Monthly Other: specify: _____

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:

Darien M. Sykes

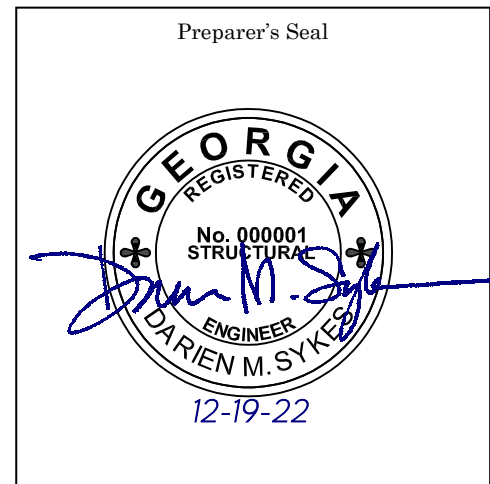
Type or print name



Signature

12-19-2022

Date



Special Inspections for Seismic Resistance

See the Schedule of Special Inspections for inspection and testing requirements

Seismic Design Category: B

Special Inspections for Seismic Resistance Required (Yes/No): No

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

(Where required per IBC Sections 1705.12.1, 1705.12.2, and 1705.12.3) (Special inspections for seismic resistance of structural steel, where required, shall be in accordance with AISC 341)

N/A

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 Chapter 13 of ASCE 7, have a component importance factor, I_p , greater than one and are in Seismic Design Categories C, D, E or F.)

N/A

Description of additional seismic systems and components requiring special inspections:

(Required for systems noted in IBC Section 1705.12.5, 1705.12.6, 1705.12.7, and 1705.12.8.)

N/A

Description of additional seismic systems and components requiring testing:

(Where required per IBC Section 1705.13)

N/A

Statement of Responsibility:

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

Special Inspections for Wind Resistance

See the Schedule of Special Inspections for inspection and testing requirements

Allowable Stress Design Wind Speed, V_{asd} : 93 m.p.h.

Wind Exposure Category: C

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

(Required in wind exposure Category B, where the allowable stress design wind speed, V_{asd} , is 120 miles per hour or greater. Required in wind exposure Category C or D, where the allowable stress design wind speed, V_{asd} , is 110 miles per hour or greater.)

Description of structural wood and cold-formed steel light frame construction main windforce-resisting system subject to special inspections for wind resistance:

(Required for systems noted in IBC Section 1705.11.1 and 1705.11.2).

N/A

Description of windforce-resisting components subject to special inspections for wind resistance:

(Required for systems and components noted in IBC Section 1705.11.3)

N/A

Statement of Responsibility:

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

FINAL REPORT OF SPECIAL INSPECTIONS

PROJECT: BELL AUDITORIUM EXPANSION AND RENOVATIONS

LOCATION: 712 TELFAIR STREET, AUGUSTA, GA 30901

ARCHITECT OF RECORD: PERKINS & WILL

STRUCTURAL ENGINEER OF RECORD: SYKES CONSULTING

MECHANICAL ENGINEER OF RECORD: M-E ENGINEERS

ELECTRICAL ENGINEER OF RECORD: M-E ENGINEERS

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: DARIEN SYKES, PE, SE

To the best of my information, knowledge, and belief, which are based upon observations or diligent supervision of our inspection services for the above referenced Project, I hereby state that the special inspections or testing required for this Project, and designated for this Agent in the *Schedule of Special Inspection Services*, have been completed in accordance with the Contract Documents.

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.

Interim reports submitted prior to this final report and numbered ___ to ___ form a basis for, and are to be considered an integral part of this final report. The following discrepancies that were outstanding since the last interim report dated _____ have been corrected:

(Attach 8 1/2"x11" continuation sheet(s) if required to complete the description of corrections)

Prepared By:

Special Inspection Agent/Firm

Type or print name

Signature

Date

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	BELL AUDITORIUM EXPANSION AND RENOVATIONS				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
1705.1.1 Special Cases (work unusual in nature, including but not limited to alternative materials and systems, unusual design applications, materials and systems with special manufacturer's requirements - add additional rows as needed.)	Submittal review, shop (3) and/or field inspection	N		N/A	
1. Inspection of anchors post-installed in solid grouted masonry: Per research reports including verification of anchor type, anchor dimensions, hole dimensions, hole cleaning procedures, anchor spacing, edge distances, masonry unit, grout, masonry compressive strength, anchor embedment and tightening torque	Field inspection	N	Periodic or as required by the research report issued by an approved source	N/A	
2. Aggregate Pier Inspection: The special inspector's responsibilities include, but are not limited to, review of the aggregate pier designer's use of soil parameters as presented in the project soils report, and during construction, verification of aggregate properties, type and number of lifts of aggregate, hole size and depths and top elevations of the pier elements, and applied energy. Additionally, results of qualitative tests on production aggregate pier elements such as modulus load testing, uplift pull-out testing, bottom stabilization tests and dynamic cone penetration tests, shall be reviewed to verify compliance with design	Field inspection	N	Periodic or as required by the research report issued by an approved source	N/A	
1705.2.1 Structural Steel Construction					
1. Fabricator and erector documents (Verify reports and certificates as listed in AISC 360, Section N 3.2 for compliance with construction documents)	Submittal Review	Y	Each submittal	1	
2. Material verification of structural steel	Shop (3) and field inspection	Y	Periodic	1	
3. Structural steel welding:					
a. Inspection tasks Prior to Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-1)	Shop (3) and field inspection	Y	Observe or Perform as noted (4)	1	
b. Inspection tasks During Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-2)	Shop (3) and field inspection	Y	Observe (4)	1	
c. Inspection tasks After Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-3)	Shop (3) and field inspection	Y	Observe or Perform as noted (4)	1	
d. Nondestructive testing (NDT) of welded joints:					
1) Complete penetration groove welds 5/16" or greater in risk category III or IV	Shop (3) or field ultrasonic testing - 100%	Y	Periodic	1	
2) Complete penetration groove welds 5/16" or greater in risk category II	Shop (3) or field ultrasonic testing - 10% of welds minimum	N	Periodic	N/A	
3) Welded joints subject to fatigue when required by AISC 360, Appendix 3, Table A-3.1	Shop (3) or field radiographic or Ultrasonic testing	Y	Periodic	1	

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	BELL AUDITORIUM EXPANSION AND RENOVATIONS				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
4) Fabricator's NDT reports when fabricator performs NDT	Verify reports	Y	Each submittal (5)	1	
4. Structural steel bolting:	Shop (3) and field inspection				
a. Inspection tasks Prior to Bolting (Observe, or perform tasks for each bolted connection, in accordance with QA tasks listed in AISC 360, Table N5.6-1)		Y	Observe or Perform as noted (4)	1	
b. Inspection tasks During Bolting (Observe the QA tasks listed in AISC 360, Table N5.6-2)		Y	Observe (4)	1	
1) Pre-tensioned and slip-critical joints					
a) Turn-of-nut with matching markings		Y	Periodic	1	
b) Direct tension indicator		Y	Periodic	1	
c) Twist-off type tension control bolt		Y	Periodic	1	
d) Turn-of-nut without matching markings		Y	Continuous	1	
e) Calibrated wrench		Y	Continuous	1	
2) Snug-tight joints		Y	Periodic	1	
c. Inspection tasks After Bolting (Perform tasks for each bolted connection in accordance with QA tasks listed in AISC 360, Table N5.6-3)		Y	Perform (4)	1	
5. Visual inspection of exposed cut surfaces of galvanized structural steel main members and exposed corners of the rectangular HSS for cracks subsequent to galvanizing	Shop (3) or field inspection	Y	Periodic	1	
6. Embedments (Verify diameter, grade, type, length, embedment. See 1705.3 for anchors)	Field inspection	Y	Periodic	1	
7. Verify member locations, braces, stiffeners, and application of joint details at each connection comply with construction documents	Field inspection	Y	Periodic	1	
1705.2.2 Cold-Formed Steel Deck					
1. Manufacturer documents (Verify reports and certificates as listed in SDI QA/QC, Section 2, Paragraphs 2.1 and 2.2 for compliance with construction documents)	Submittal Review	Y	Each submittal	1	
2. Material verification of steel deck, mechanical fasteners and welding materials	Shop (3) and field inspection	Y	Periodic	1	
3. Cold-formed steel deck placement:	Shop (3) and field inspection				
a. Inspection tasks Prior to Deck Placement (Perform the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.1)		Y	Perform (4)	1	
b. Inspection tasks After Deck Placement (Perform the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.2)		Y	Perform (4)	1	
4. Cold-formed steel deck welding:	Shop (3) and field inspection				
a. Inspection tasks Prior to Welding (Observe the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.3)		Y	Observe (4)	1	
b. Inspection tasks During Welding (Observe the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.4)		Y	Observe (4)	1	
c. Inspection tasks After Welding (Perform the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.5)		Y	Perform (4)	1	
5. Cold-formed steel deck mechanical fastening:	Shop (3) and field inspection				

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	BELL AUDITORIUM EXPANSION AND RENOVATIONS				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
a. Inspection tasks Prior to Mechanical Fastening (Observe the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.6)		Y	Observe (4)	1	
b. Inspection tasks During Mechanical Fastening (Observe the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.7)		Y	Observe (4)	1	
c. Inspection tasks After Mechanical Fastening (Perform the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.8)		Y	Perform (4)	1	
1705.2.3. Open-Web Steel Joists and Joist Girders					
1. Installation of open-web steel joists and joist girders.					
a. End connections - welding or bolted.	per SJI CJ or SJI 100	N	Periodic	N/A	
b.. Bridging - horizontal or diagonal.		N		N/A	
1) Standard bridging.	per SJI CJ or SJI 100	N	Periodic	N/A	
2) Bridging that differs from the specifications listed in SJI CJ or SJI 100.		N	Periodic	N/A	
1705.2.4. Cold-Formed Steel Trusses Spanning 60 feet or Greater					
Verify temporary and permanent restraint/bracing are installed in accordance with the approved truss submittal package	Field inspection	N	Periodic	N/A	
1705.3 Concrete Construction					
1. Inspect reinforcement, including prestressing tendons, and verify placement.	Shop (3) and field inspection	N	Periodic	N/A	
2. Reinforcing bar welding:					
a. Verification of weldability of bars other than ASTM A706.		Y	Periodic	1	
b. Inspection of single-pass fillet welds 5/16 or less in size.		Y	Periodic	1	
c. Inspection of all other welds.		Y	Continuous	1	
3. Inspection of anchors cast in concrete.	Shop (3) and field inspection	Y	Periodic	1	
4. Inspection of anchors post-installed in hardened concrete members per research reports, or, if no specific requirements are provided, requirements shall be provided by the registered design professional and approved by GSFIC, including verification of 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 or as required by the research report issued by an approved source	1	
a. Adhesive anchors installed in horizontal or upward-inclined orientation that resist sustained tension loads.		Y	Continuous	1	
b. Mechanical and adhesive anchors not defined in 4a.		Y	Periodic	1	
5. Verify use of approved design mix	Shop (3) and field inspection	Y	Periodic	1	
6. a. Prior to placement, fabricate specimens for strength tests, fresh concrete sampling, perform slump or slump flow, and air content density tests, and determine temperature of concrete.	Shop (3) and field inspection	Y	Continuous	1	
6. b. Verify that concrete specimens for strength tests are maintained in the required initial curing and laboratory curing environment, and that the maximum and minimum temperatures during the initial curing period are reported	Shop (3) and field inspection	Y	Continuous	1	

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	BELL AUDITORIUM EXPANSION AND RENOVATIONS				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
7. Inspection of concrete and shotcrete placement for proper application techniques	Shop (3) and field inspection	Y	Continuous	1	
8. Verify maintenance of specified curing temperature and techniques	Shop (3) and field inspection	Y	Periodic	1	
9. Inspection of prestressed concrete:	Shop (3) and field inspection				
a. Application of prestressing force		N	Continuous	N/A	
b. Grouting of bonded prestressing tendons		N	Continuous	N/A	
10. Inspect erection of precast concrete members		N	Periodic	N/A	
11. 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	N/A	
12. Inspection of formwork for shape, lines, location and dimensions	Field inspection	Y	Periodic	1	
13. Concrete strength testing and verification of compliance with construction documents	Field testing and review of laboratory reports	Y	Periodic	1	
1705.4 Masonry Construction					
MINIMUM VERIFICATION REQUIREMENTS					
(A) Level 1, 2 and 3 Quality Assurance:					
1. Prior to construction, verification of compliance of submittals	Submittal Review	Y	Prior to Construction	1	
(B) Level 2 & 3 Quality Assurance:					
1. Prior to construction verification of f_m and f_{AAC} except where specifically exempted by the code	Testing by unit strength method or prism test method	Y	Prior to Construction	1	
2. During construction, verification of Slump Flow and Visual Stability Index (VSI) when self-consolidating grout is delivered to project site.	Testing by unit strength method or prism test method	Y	Periodic	1	
(C) Level 3 Quality Assurance:					
1. During construction, verification of f_m and f_{AAC} for every 5,000 SF	Testing by unit strength method or prism test method	Y	Periodic	1	
2. During construction, verification of proportions of materials as delivered to the project site for premixed or preblended mortar, prestressing grout, and grout other than self-consolidating grout.	Field inspection	Y	Periodic	1	
MINIMUM SPECIAL INSPECTION REQUIREMENTS					
(D) Levels 2 and 3 Quality Assurance:					
1. As masonry construction begins, verify that the following					
a. Proportions of the site-prepared mortar	Field inspection	Y	Periodic	1	

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	BELL AUDITORIUM EXPANSION AND RENOVATIONS				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
b. Grade and size of prestressing tendons and anchorages	Field Inspection	N	Periodic	N/A	
c. Grade, type, and size of reinforcement, anchor bolts, and prestressing tendons and anchorages	Field Inspection	Y	Periodic	1	
d. Prestressing technique	Field Inspection	N	Periodic	N/A	
e. Properties of thin-bed mortar for AAC masonry	Field Inspection	N	Level 2 - Continuous ^(b) Level 2 - Periodic ^(c)	N/A	
(b) Required for the first 5,000 square feet (c) Required after the first 5,000 square feet		N	Level 3 - Continuous	N/A	
		N	Level 2 - Periodic	N/A	
f. Sample panel construction	Field Inspection	N	Level 2 - Periodic	N/A	
		N	Level 3 - Continuous	N/A	
2. Prior to grouting, verify that the following are in					
		Y	Level 2 - Periodic	1	
a. Grout space	Field Inspection	N	Level 3 - Continuous	N/A	
		N	Level 3 - Continuous	N/A	
b. Placement of prestressing tendons and anchorages	Field Inspection	N	Periodic	N/A	
c. Placement of reinforcement, connectors, and anchor bolts	Field inspection	Y	Level 2 - Periodic	1	
		N	Level 3 - Continuous	N/A	
d. Proportions of site-prepared grout and prestressing grout for bonded tendons	Field Inspection	N	Periodic	N/A	
3. Verify compliance of the following during construction:					
a. Materials and procedures with the approved submittals	Field inspection	Y	Periodic	1	
b. Placement of masonry units and mortar joint construction	Field Inspection	Y	Periodic	1	
c. Size and location of structural members	Field inspection	N	Periodic	N/A	
d. Type, size, location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction	Field inspection	Y	Level 2 - Periodic	1	
		N	Level 3 - Continuous	N/A	
e. Welding of reinforcement	Field inspection	N	Continuous	N/A	
f. Preparation, construction, and protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F)	Field inspection	Y	Periodic	1	
g. Application and measurement of prestressing force	Field testing	N	Continuous	N/A	
h. Placement of grout and prestressing grout for bonded tendons is in compliance	Field inspection	N	Continuous	N/A	
i. Placement of AAC masonry units and construction of thin-bed mortar joints	Field inspection	N	Level 2 - Continuous ^(b) Level 2 - Periodic ^(c)	N/A	
		N	Level 3 - Continuous	N/A	
(b) Required for the first 5,000 square feet (c) Required after the first 5,000 square feet					
4. Observe preparation of grout specimens, mortar specimens, and/or prisms	Field inspection	Y	Level 2 - Periodic	1	
		N	Level 3 - Continuous	N/A	

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	BELL AUDITORIUM EXPANSION AND RENOVATIONS				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
1705.5 Wood Construction					
1. For prefabricated wood structural elements, inspection of the fabrication process and assemblies in accordance with Section 1704.2.5.	In-plant review (3)	N	Periodic	N/A	
2. For high-load diaphragms, verify grade and thickness of structural panel sheathing agree with approved building plans.	Field inspection	N	Periodic	N/A	
3. 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 agree with approved building plans	Field inspection	N	Periodic	N/A	
4. Metal-plate-connected wood trusses:					
a. Verification that permanent individual truss member restraint/bracing has been installed in accordance with the approved truss submittal package when the truss height is greater than or equal to 60"	Field inspection	N	Periodic	N/A	
b. For trusses spanning 60 feet or greater: verify temporary and permanent restraint/bracing are installed in accordance with the approved truss submittal package	Field inspection	N	Periodic	N/A	
1705.5.3 Mass Timber Construction					
1. Inspection of anchorage and connection of mass timber construction to timber deep foundation systems.	Field inspection	N	Periodic	N/A	
2. Inspect erection of mass timber construction.	Field inspection	N	Periodic	N/A	
3. Inspection of connections where installation methods are required to meet design loads.					
a. Threaded Fasteners					
1) Verify use of proper installation equipment.	Field inspection	N	Periodic	N/A	
2) Verify use of pre-drilled holes where required.	Field inspection	N	Periodic	N/A	
3) Inspect screws, including diameter, length, head type, spacing, installation angle, and depth.	Field inspection	N	Periodic	N/A	
b. Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads.	Field inspection	N	Continuous	N/A	
c. Other adhesive anchors.	Field inspection	N	Periodic	N/A	
d. Bolted connections.	Field inspection	N	Periodic	N/A	
e. Concealed connections	Field inspection	N	Periodic	N/A	

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	BELL AUDITORIUM EXPANSION AND RENOVATIONS				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
1705.6 Soils					
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Field inspection	Y	Periodic	1	
2. Verify excavations are extended to proper depth and have reached proper material.	Field inspection	Y	Periodic	1	
3. Perform classification and testing of compacted fill materials.	Field inspection	Y	Periodic	1	
4. Verify use of proper materials, densities, and lift thicknesses during placement and compaction of controlled fill	Field inspection	Y	Continuous	1	
5. Prior to placement of controlled fill, inspect subgrade and verify that site has been prepared properly	Field inspection	Y	Periodic	1	
1705.7 Driven Deep Foundations					
1. Verify element materials, sizes and lengths comply with requirements	Field inspection	Y	Continuous	1	
2. Determine capacities of test elements and conduct additional load tests, as required	Field inspection	Y	Continuous	1	
3. Inspect driving operations and maintain complete and accurate records for each element	Field inspection	Y	Continuous	1	
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element	Field inspection	Y	Continuous	1	
5. For steel elements, perform additional inspections per Section 1705.2	See Section 1705.2	Y	See Section 1705.2	1	
6. For concrete elements and concrete-filled elements, perform tests and additional inspections per Section 1705.3	See Section 1705.3	Y	See Section 1705.3	1	
7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge	Field inspection	Y	In accordance with construction documents	1	
1705.8 Cast-in-Place Deep Foundations					
1. Inspect drilling operations and maintain complete and accurate records for each element	Field inspection	N	Continuous	N/A	
2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end-bearing strata capacity. Record concrete or grout volumes	Field inspection	N	Continuous	N/A	
3. For concrete elements, perform tests and additional inspections in accordance with Section 1705.3	See Section 1705.3	N	See Section 1705.3	N/A	
1705.9 Helical Pile Foundations					
Verify installation equipment, pile dimensions, tip elevations, final depth, final installation torque and other installation data as required by construction documents.	Field inspection	Y	Continuous	1	

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	BELL AUDITORIUM EXPANSION AND RENOVATIONS				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
1705.10 Fabricated items					
1. List of fabricated items requiring special inspection during fabrication:	Shop inspection	N	As noted in each applicable shop activity	N/A	
2. List of fabricated items to be fabricated on the premises of a fabricator approved to perform such work without special inspection (including name of approved agency providing periodic audits):		N		N/A	
1705.11.1 Structural Wood Special Inspections For Wind Resistance					
1. Inspection of field gluing operations of elements of the main windforce-resisting system	Field inspection	N	Continuous	N/A	
2. Inspection of nailing, bolting, anchoring and other fastening of components within the main windforce-resisting system, including wood shear walls, wood diaphragms, drag struts, braces and hold-downs	Shop (3) and field inspection	N	Periodic	N/A	
1705.11.2 Cold-formed Steel Special Inspections For Wind Resistance					
1. Inspection during welding operations of elements of the main windforce-resisting system	Shop (3) and field inspection	N	Periodic	N/A	
2. Inspection of screw attachment, bolting, anchoring and other fastening of components within the main windforce-resisting system, including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs	Shop (3) and field inspection	N	Periodic	N/A	
1705.11.3 Wind-resisting Components					
1. Roof covering, roof deck and roof framing connections.	Shop (3) and field inspection	Y	Periodic	1	
2. Exterior wall covering and wall connections to roof and floor diaphragms.	Shop (3) and field inspection	Y	Periodic	1	
1705.12.1 Structural Steel Special Inspections for Seismic Resistance					
1. Seismic force-resisting systems in SDC B, C, D, E, or F.	Shop (3) and field inspection	Y	In accordance with AISC 341	1	
2. Structural steel elements in SDC B, C, D, E, or F other than those in Item 1, including struts, collectors, chords and foundation elements.	Shop (3) and field inspection	Y	In accordance with AISC 341	1	
1705.12.2 Structural Wood Special Inspections for Seismic Resistance					
1. Field gluing operations of elements of the seismic-force resisting system for SDC C, D, E or F.	Field inspection	N	Continuous	N/A	
2. Nailing, bolting, anchoring and other fastening of components within the seismic-force-resisting system including wood shear walls, wood diaphragms, drag struts, shear panels and hold-downs for SDC C, D, E or F.	Shop (3) and field inspection	N	Periodic	N/A	
1705.12.3 Cold-formed Steel Light-Frame Construction Special Inspections for Seismic Resistance					
1. During welding operations of elements of the seismic-force-resisting system for SDC C, D, E or F.	Shop (3) and field inspection	N	Periodic	N/A	
2. Screw attachment, bolting, anchoring and other fastening of components within the seismic-force-resisting system including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs for SDC C, D, E or F.	Shop (3) and field inspection	N	Periodic	N/A	

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	BELL AUDITORIUM EXPANSION AND RENOVATIONS				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
1705.12.4 Designated Seismic Systems Verification Special Inspections for Seismic Resistance					
For SDC C, D, E or F, inspect and verify that the component label, anchorage or mounting conforms to the certificate of compliance in accordance with ASCE 7 Section 13.2.2.	Field inspection	N	Periodic	N/A	
1705.12.5 Architectural Components Special Inspections for Seismic Resistance					
1. For SDC D, E or F, inspection during the erection and fastening of exterior cladding and interior or exterior veneer more than 30 feet above grade or walking surface and weighing more than 5 psf.	Field inspection	N	Periodic	N/A	
2. For SDC D, E or F, inspection during the erection and fastening of interior nonbearing walls more than 30 feet above grade or walking surface and weighing more than 15 psf.	Field inspection	N	Periodic	N/A	
3. For SDC D, E or F, inspection during the erection and fastening of exterior nonbearing walls more than 30 feet above grade or walking surface.	Field inspection	N	Periodic	N/A	
4. For SDC D, E or F, inspection during anchorage of access floors	Field inspection	N	Periodic	N/A	
1705.12.6 Plumbing, Mechanical and Electrical Components Special Inspections for Seismic Resistance					
1. Inspection during the anchorage of electrical equipment for emergency or standby power systems in SDC C, D, E or F	Field inspection	N	Periodic	N/A	
2. Inspection during the anchorage of other electrical equipment in SDC E or F	Field inspection	N	Periodic	N/A	
3. Inspection during installation and anchorage of piping systems designed to carry hazardous materials, and their associated mechanical units in SDC C, D, E or F	Field inspection	N	Periodic	N/A	
4. Inspection during the installation and anchorage of HVAC ductwork designed to contain hazardous materials in SDC C, D, E or F	Field inspection	N	Periodic	N/A	
5. Inspection during the installation and anchorage of vibration isolation systems in SDC C, D, E or F where nominal clearance of 1/4 inch or less is required by the approved construction documents.	Field inspection	N	Periodic	N/A	
6. Inspection during installation of mechanical and electrical equipment, including duct work, piping systems and their structural supports, where automatic fire sprinkler systems are installed in structures assigned to SDC C, D, E, or F to verify one of the following unless flexible sprinkler hose fittings are used:		N		N/A	
a. ASCE/SEI 7, Section 13.2.3 minimum required clearances have been provided.	Field inspection	N	Periodic	N/A	
b. A three inch or greater nominal clearance has been provided between fire protection sprinkler system drops and sprigs and structural members not used collectively or independently to support the sprinklers; equipment attached to the building structure; and other systems' piping.	Field inspection	N	Periodic	N/A	

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	BELL AUDITORIUM EXPANSION AND RENOVATIONS				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
1705.12.7 Storage Racks Special Inspections for Seismic Resistance					
Inspection during the anchorage of storage racks 8 feet or greater in height in structures assigned to SDC D, E or F.	Field inspection	N	Periodic	N/A	
1705.12.8 Seismic Isolation Systems					
Inspection during the fabrication and installation of isolator units and energy dissipation devices used as part of the seismic isolation system in structures assigned to SDC B, C, D, E or F.	Shop and field inspection	N	Periodic	N/A	
1705.12.9 Cold-formed Steel Special Bolted Moment Frames					
Inspection of installation of cold-formed steel special bolted moment frames in the seismic force-resisting systems in structures assigned to SDC D, E or F.	Field inspection	N	Periodic	N/A	
1705.13.1 Structural Steel Testing for Seismic Resistance					
1. Nondestructive testing of structural steel in the seismic force-resisting systems in accordance with AISC 341 in structures assigned to SDC B, C, D, E or F.	Field test	N	Periodic	N/A	
2. Nondestructive testing of structural steel elements in the seismic force-resisting systems not covered in 1 above including struts, collectors, chords and foundation elements in accordance with AISC 341 in structures assigned to SDC B, C, D, E or F.	Field test	N	Periodic	N/A	
1705.13.2 Seismic Certification of Nonstructural Components					
Review certificate of compliance for designated seismic system components in structures assigned to SDC B, C, D, E or F.	Certificate of compliance review	N	Each submittal	N/A	
1705.13.3 Seismic Certification of Designated Seismic Systems					
Review certificate of compliance for designated seismic system components in structures assigned to SDC C, D, E or F.	Certificate of compliance review	N	Each submittal	N/A	
1705.13.4 Seismic Isolation Systems					
Test seismic isolation system in accordance with ASCE 7 Section 17.8 in structures assigned to SDC B, C, D, E or F.	Prototype testing	N	Per ASCE 7	N/A	
1705.14 Sprayed Fire-resistant Materials					
1. Verify surface condition preparation of structural members	Field inspection	Y	Periodic	1	
2. Verify minimum thickness of sprayed fire-resistant materials applied to structural members	Field inspection	Y	Periodic	1	
3. Verify density of the sprayed fire-resistant material complies with approved fire-resistant design	Field inspection and testing	Y	Per IBC Section 1705.14.5	1	
4. Verify the cohesive/adhesive bond strength of the cured sprayed fire-resistant material	Field inspection and testing	Y	Per IBC Section 1705.14.6	1	
5. Condition of finished application	Field inspection	Y	Periodic	1	

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	BELL AUDITORIUM EXPANSION AND RENOVATIONS				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
1705.15 Mastic and Intumescent Fire-Resistant Coatings					
Inspect and test mastic and intumescent fire-resistant coatings applied to structural elements and decks per AWCI 12-B	Field inspection and testing	Y	Periodic	1	
1705.16 Exterior Insulation and Finish Systems (EIFS)					
Inspection of water-resistive barrier over sheathing substrate	Field inspection	N	Periodic	N/A	
1705.17 Fire-Resistant Penetrations and Joints					
1. Inspect penetration firestop	Field testing	Y	Per ASTM E2174	1	
2. Inspect fire-resistant joint	Field testing	Y	Per ASTM E2393	1	
1705.18 Smoke Control Systems					
1. Leakage testing and recording of device locations prior to concealment	Field testing	Y	Periodic	1	
2. Prior to occupancy and after sufficient completion, pressure difference testing, flow measurements, and detection and control verification	Field testing	Y	Periodic	1	
1705.19 Sealing of Mass Timber Construction					
1. Inspect sealants and adhesives to resist passage of air in buildings of Type IV-A, IV-B, and IV-C..	Field testing	N	Periodic	N/A	
a. At abutting edges and intersections of mass timber building elements required to be fire-resistance rated.	Field testing	N	Periodic	N/A	
b. At abutting intersections of mass timber building elements and building elements of other materials where both are required to be fire-resistance rated.	Field testing	N	Periodic	N/A	
* INSPECTION AGENTS					
FIRM		ADDRESS		TELEPHONE NO.	
1. NOVA Engineering and Environmental, LLC		1601 Hartrich Rd, Augusta, GA 30906		770-425-0777	
2.					
3.					
4.					
<p>Notes: 1. The inspection and testing agent(s) shall be engaged by the the Design Professional or GSFIC, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Design Professional and GSFIC prior to commencing work. The qualifications of the Special Inspector(s) and/or testing agencies may be subject to the approval of GSFIC and/or the Design Professional.</p> <p>2. The list of Special Inspectors may be submitted as a separate document, if noted so above.</p> <p>3. Shop Inspections of fabricated items are not required where the fabricator is approved in accordance with IBC Section 1704.2.5.1 and listed in activity 1709.2.</p> <p>4. Observe: Observe on a random basis, operations need not be delayed pending these inspections. Perform: These tasks shall be performed for each welded joint, bolted connection, or steel element.</p> <p>5. NDT of welds completed in an approved fabricator's shop may be performed by that fabricator when approved by GSFIC. Refer to AISC 360, N6.</p>					
Are Special Inspections for Seismic Resistance included in the Statement of Special Inspections?				Yes	No
Are Special Inspections for Wind Resistance included in the Statement of Special Inspections?				Yes	No
Date: 12-19-2022					

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, Special Inspections for Seismic or Wind Resistance, must submit a Statement of Responsibility.

Project: Bell Auditorium Expansion and Renovations

Contractor's Name: McKnight Construction Company

Address: 635 NW Frontage Rd, Augusta, GA 30907

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

Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2.5.1 of the International Building Code must submit *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project: Bell Auditorium Expansion and Renovations

Fabricator's Name: _____

Address: _____

Certification or Approval Agency: _____

Certification Number: _____

Date of Last Audit or Approval: _____

Description of structural members and assemblies that have been fabricated:

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

Name and Title (type or print)

Signature

Date

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

SPECIAL INSPECTION DAILY REPORT

PROJECT NAME / ADDRESS:	
INSPECTION TYPE(S) COVERAGE <div style="display: flex; justify-content: space-around;"> <input type="checkbox"/> CONTINUOUS <input type="checkbox"/> PERIODIC </div> TIME BEGINNING INSPECTION: TIME ENDING INSPECTION:	
DESCRIBE INSPECTIONS MADE, INCLUDING LOCATIONS:	
LIST TESTS MADE:	
LIST ITEMS REQUIRING CORRECTIONS, CORRECTIONS OF PREVIOUSLY LISTED ITEMS AND PREVIOUSLY LISTED UNCORRECTED ITEMS: PROVIDE COPIES OF DISCREPANCY NOTICES:	
COMMENTS:	
TO THE BEST OF MY KNOWLEDGE, WORK INSPECTED WAS IN ACCORDANCE WITH THE APPROVED DESIGN DRAWINGS, AND SPECIFICATIONS, EXCEPT AS NOTED ABOVE.	
PRINTED FULL NAME	
NOTE BY "SPECIAL INSPECTOR" OR	
SIGNED:	DATE:
CERTIFICATION:	NUMBER:

One copy of this report to remain at job site with the contractor for review upon request.

SPECIAL INSPECTION INTERIM REPORT

PROJECT NAME / ADDRESS:								
INSPECTION TYPE(S) COVERAGE <div style="display: flex; justify-content: space-around;"> <input type="checkbox"/> CONTINUOUS TIME BEGINNING INSPECTION: <input type="checkbox"/> PERIODIC TIME ENDING INSPECTION: </div>								
DESCRIBE INSPECTIONS MADE, INCLUDING LOCATIONS:								
LIST TESTS MADE:								
TOTAL INSPECTION TIME EACH DAY	DATE							
	HOURS							
LIST ITEMS REQUIRING CORRECTIONS, CORRECTIONS OF PREVIOUSLY LISTED ITEMS AND PREVIOUSLY LISTED UNCORRECTED ITEMS: PROVIDE COPIES OF DISCREPANCY NOTICES:								
COMMENTS:								
TO THE BEST OF MY KNOWLEDGE, WORK INSPECTED WAS IN ACCORDANCE WITH THE APPROVED DESIGN DRAWINGS, AND SPECIFICATIONS, EXCEPT AS NOTED ABOVE.								
PRINTED FULL NAME								
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY								
SIGNED:						DATE:		
CERTIFICATION:						NUMBER:		

One copy of this report to remain at job site with the contractor for review upon request.

SPECIAL INSPECTION DISCREPANCY NOTICE

PROJECT NAME / ADDRESS:		
INSPECTION TYPE(S) COVERAGE		
<input type="checkbox"/> CONTINUOUS <input type="checkbox"/> PERIODIC		
AREA INSPECTED	TYPE OF INSPECTION	
NOTICE DELIVERED TO: <input type="radio"/> CONTRACTOR <input type="radio"/> Design Professional <input type="radio"/> GSFIC	DATE:	TIME:
MAKE THE FOLLOWING CORRECTIONS AND SECURE INSPECTION APPROVAL PRIOR TO PROCEEDING WITH THIS PHASE OF THE WORK.		
PRINTED FULL NAME		
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY		
SIGNED:	DATE:	
CERTIFICATION:	NUMBER:	

One copy of this report to remain at job site with the contractor for review upon request.

SECTION 01 56 39

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Requirements:
 - 1. Section 31 00 00 "Clearing, Grubbing, and Demolition" for removing existing trees and shrubs.

1.2 REFERENCE STANDARDS

- A. ANSI A300, Part 5: Site Planning, Site Development

1.3 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape at a height 6 inches (150 mm) above the ground for trees up to and including 4-inch (100-mm) size at this height and as measured at a height of 12 inches (300 mm) above the ground for trees larger than 4-inch (100-mm) size.
- B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line and 4 to 6-inches deep, unless otherwise indicated.
- D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of the following:
 - 1. Organic Mulch: 1-pint0.5-L volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
 - 2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
- C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
 - 1. Species and size of tree.

2. Location on site plan. Include unique identifier for each.
3. Reason for pruning.
4. Description of pruning to be performed.
5. Description of maintenance following pruning.

1.5 INFORMATIONAL SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Arborist Qualifications: Certified Arborist as certified by ISA.
- B. 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.
- C. Preinstallation Conference: Before starting tree protection and trimming, meet with representatives of authorities having jurisdiction, local arborist, Owner, Landscape Architect, consultants and other concerned entities as needed. Review tree protection and trimming procedures and responsibilities.

1.7 FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:
 1. Storage of construction materials, debris, or excavated material.
 2. Moving or parking vehicles or equipment.
 3. Foot traffic.
 4. Erection of sheds or structures.
 5. Impoundment of water.
 6. Excavation or other digging unless otherwise indicated.

7. Attachment of signs to or wrapping materials around trees or plants that are not considered protection 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. Backfill Soil: Stockpiled soil mixed with planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.
 1. Mixture: Well-blended mix of two parts stockpiled soil to one part planting soil.
- 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: Ground or shredded bark.
 2. Size Range: 3 inches (76 mm) maximum, 1/2-inch (13 mm) minimum.
 3. Color: Natural.
- C. Protection-Zone Fencing: Fencing fixed in position utilizing materials approved by Owner.
- 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. Size and Text: As shown on Drawings.
 2. Lettering: 3-inch- (75-mm-) high minimum, black characters on white 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.
- B. Prepare written report, endorsed by local arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

- A. Before construction begins, fertilize affected trees to improve tree vigor and health. Soil analysis testing should be completed to assure fertilization with the appropriate fertilizer products.
- B. Temporary Fencing: Install temporary fencing located at or outside the drip line of trees.
- C. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag each tree trunk at 54 inches (1372 mm) above the ground.
- D. 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.
- E. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.
 - 1. Apply 4-inch (100-mm) uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches (150 mm) of tree trunks.

3.3 GENERAL MAINTENANCE

- A. Planting within construction site shall be irrigated, fertilized, and maintained per Owner's standards and approved maintenance plan submittal.

3.4 PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones in a manner that will prevent people from easily entering protected areas 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. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
 - 2. 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.
 - 3. Access Gates: Install where indicated or required; 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 (15 m) 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. 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.

3.5 EXCAVATION

- A. Do not excavate within drip line of trees.
- B. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.
 - 1. Cut roots approximately 3 inches back from new construction.
 - 2. 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. Protect roots from damage until they are permanently relocated and covered with soil.
- C. Where utility trenches are required within drip line of trees, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.
- D. Root Pruning: Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.

3.6 ROOT PRUNING

- A. Prune roots that are affected by temporary and permanent construction. Prune roots as shown on Drawings and as follows:
 - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not heavy equipment that will rip, tear, or pull 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 Section 31 20 00 "Earth Moving."
- B. Root Pruning at Edge of Protection Zone: Prune tree roots 12 inches (300 mm) 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 or with air spade to the depth of the required excavation to minimize damage to tree root systems. If

excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.7 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches as shown on Drawings, or under direction of arborist.
 - 1. Prune to remove only broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
 - 2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
 - 3. Pruning Standards: Prune trees according to ANSI A300 (Part 1) and as follows:
 - a. Crown Cleaning.
 - b. Crown thinning.
 - c. Crown reduction.
- B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.
- C. Cut branches with sharp pruning instruments; do not break or chop.
- D. Do not paint or apply sealants to wounds.
- E. Provide subsequent maintenance pruning during Contract period as recommended by local arborist.
- F. Chip removed branches and spread over areas identified by Architect.

3.8 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 local 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.

3.9 FIELD QUALITY CONTROL

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

3.10 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
 - 1. Small Trees: Provide new trees of same species and equivalent caliper size as those being replaced in accordance with Owner and authority having jurisdiction requirements.
 - 2. Large Trees: Provide one new tree(s) of 6-inch (150-mm) caliper size for each tree being replaced that measures more than 6 inches (150 mm)] in caliper size.
 - a. Species: As selected by Architect.
 - 3. Plant and maintain new trees as specified in Section 32 93 00 "Plants."
- C. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 4-inch (100-mm) uniform thickness to remain.

3.11 SOIL AERATION

- A. Aerate surface soil compacted during construction, 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 on center. Backfill holes with an equal mix of augured soil and sand.

3.12 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Burning of removed trees and branches is not permitted.
- B. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 01 25 00 "Substitution Procedures" for requests for substitutions after bid /pricing.
 - 2. Section 01 42 00 "References" for applicable industry standards for products specified.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. [Manufacturer's published attributes and characteristics of basis-of-design

product also establish salient characteristics of products for purposes of evaluating comparable products.]

- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. 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.

1.3 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Identification of basis-of-design product, fabrication, or installation method to be replaced, including Specification Section number and title, and Drawing numbers and titles.
- B. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
- C. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.
- D. Substitution: Refer to Section 01 25 00 "Substitution Procedures" for definition and limitations on substitutions.

1.4 QUALITY ASSURANCE

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

1.5 COORDINATION

- A. Coordinate affected Work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

1.8 PROHIBITION ON INCORPORATION OF HAZARDOUS MATERIALS

- A. Owner is responsible for ascertaining that materials within the existing facility, which will be disturbed as part of the work, are free of asbestos containing materials and for performing surveys and/or providing certifications attesting regarding this.
- B. Architect and its consultants have not knowingly specified for incorporation into the work, materials or products containing hazardous materials or toxic substances (including asbestos).
- C. Contractor (including its subcontractors, sub-subcontractors, and material suppliers/fabricators under its control) is prohibited from incorporating any material or products into the work containing hazardous materials or toxic substances.
- D. As part of completed materials and products list required herein, Contractor shall assemble, for the Owner's records, the Material Safety Data Sheets (MSDS) for all materials and products incorporated into the work. These MSD sheets shall be updated upon final completion of the work to incorporate changes which have occurred during the course of the work due to approved substitution requests and other modifications. Architect will not review, nor approve, the MSD sheets. The Contractor, also as a pre-requisite to achieving final completion, shall provide a certificate to the Owner indicating that no hazardous or toxic materials or products were incorporated into the work.
- E. Architect and its consultants are not responsible for the presence of hazardous materials or toxic substances in or around the work, nor the exposure to persons who construct or subsequently occupy the work. The Architect will not provide certifications regarding the presence or absence of such materials or substances.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Substitutions may be considered, unless otherwise indicated, when submitted in accordance with provisions of Section 01 25 00.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Substitutions may be considered, unless otherwise indicated, when submitted in accordance with provisions of Section 01 25 00.
 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 - 1) Substitutions may be considered, unless otherwise indicated, when submitted in accordance with provisions of Section 01 25 00.
 - c. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for

- Contractor's convenience will not be considered unless otherwise indicated.
- d. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
 - 1) Substitutions may be considered, unless otherwise indicated, when submitted in accordance with provisions of Section 01 25 00.
 4. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
 5. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer.
 - a. Submitted in accordance with provisions of Section 01 25 00.
 6. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named.
 - a. Substitutions may be considered, unless otherwise indicated, when submitted in accordance with provisions of Section 01 25 00.
 - C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.
 - D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
 1. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 2. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or

texture from manufacturer's product line that includes both standard and premium items.

3. Full Industry Range: Where Specifications include the phrase "full industry range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from any listed manufacturer's product line that includes both standard and premium items.
4. "Custom Color as selected by Architect" or "to match color on file in Architect's office", "match Architect's sample" means that the color selected is custom and requires custom formulations and submissions of color to obtain Architect's approval prior to application.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 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.
- B. Submitted in accordance with provisions of Section 01 25 00.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 73 00

EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
- B. Related Requirements:
 - 1. Section 01 10 00 "Summary" for limits on use of Project site.
 - 2. Section 01 33 00 "Submittal Procedures" for submitting surveys.
 - 3. Section "01 73 29 "Cutting and Patching".
 - 4. 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.
 - 5. Section 02 41 19 "Selective Demolition" for demolition and removal of selected portions of the building.
 - 6. Section 07 84 13 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 DEFINITIONS

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

1.3 INFORMATIONAL SUBMITTALS

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

- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit two copies signed by land surveyor.
- E. Final Property Survey: Submit 2 copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examination of the Site and Records of Existing Construction and Conditions: Examine the site, the records of existing construction, and the conditions under which the Work is to be performed. Notify the Architect immediately if existing conditions discovered will affect the Work as shown on the Contract Documents
- B. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping, underground electrical services, and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Existing Conditions Depicted in the Contract Documents: The Contract Documents are based upon the information furnished to the Architect by the Owner. Such information is available from the Owner. The records are furnished for information only and may not represent all conditions that will be encountered. The records of existing construction represent conditions known to the Owner. Other construction, of which no records are available, may be encountered. Dimensions of existing construction are based on information provided to the Architect by the Owner. The

Contractor and each subcontractor shall field verify dimensions of existing conditions.

- D. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- E. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- F. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.

- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 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 limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
 - 7. 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 rim and invert elevations.
 - D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
 - E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.
- 3.4 FIELD ENGINEERING
- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
 - B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
 - C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. 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.
- E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.
- B. Precautions Against Movement or Settlement: The Contractor shall take precautions, including bracing, shoring, underpinning, or other retaining structures, to guard against movement or settlement of existing or new construction. Assume responsibility for the design, safety, and support of such construction, and for movement, settlement, damage, or injury resulting from the construction.
- C. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- D. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- E. 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.

- F. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- G. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- H. 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.
- I. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- J. 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.
- K. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

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

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- 3.8 STARTING AND ADJUSTING
- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 13 "General Commissioning Requirements."
 - B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements for cutting and patching.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.
- C. Cutting and patching is performed for coordination of the Work, to uncover Work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.
- D. Restoring or removing and replacing non-complying work is specified separately from cutting-and-patching but may require cutting-and-patching operations as specified herein.

1.3 SUBMITTALS

- A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Coordinate with Owner if Cutting and Patching Plan will be required.
 - 2. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 3. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 4. Products: List products to be used for patching and firms or entities that will perform patching work.
 - 5. Dates: Indicate when cutting and patching will be performed.
 - 6. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.4 QUALITY ASSURANCE

- A. Comply with requirements for and limitations on cutting and patching of construction elements.
1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 2. 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.
 3. Other Construction Elements: Do not cut and patch other construction elements or 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.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.5 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Owner and Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Materials to be cut and patched include those damaged by the performance of the Work.

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

3.2 PREPARATION

- A. 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.
- B. Temporary Support: Provide temporary support of Work to be cut.
- C. Protection: Protect existing 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.
- D. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- E. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
- 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 practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will 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.
 - a. Where patching occurs in a painted surface, prepare substrate, and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- D. Fire Rated Construction: At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 13 "Penetration Firestopping", to full thickness of the penetrated element.
- E. Roofing: Where penetrations are made through the roof system to accommodate mechanical, electrical, or plumbing systems, or any other reason associated with the Work, repair in accordance with the original manufacturer's requirements. Install curbs, cants, flashing and other roof system components in accordance with Specifications within this Project Manual and recommendations by the manufacturer of the roof system presently in place. Return assembly to weather-tight condition. Also refer to Division 07 section on roof modifications or repairs.
- F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 02 41 19 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.

1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.
- G. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable and reusable material.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.4 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Practice efficient waste management in the use of materials in the course of the Work. Use reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

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. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 - 1. Distribute waste management plan to everyone concerned within 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.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. If applicable, 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 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.

5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
 - B. Salvaged Items for Sale and Donation: Not permitted on Project site.
 - C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
 1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
 - D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
 - E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
 - F. Plumbing Fixtures: Separate by type and size.
 - G. Lighting Fixtures: Separate lamps by type and protect from breakage.
 - H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
- 3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL
- A. General:
 1. If applicable, comply with Owner's recycling program.
 2. Recycle as much non-hazardous demolition and construction waste material as possible.
 - a. Recycle paper and beverage containers used by on-site workers.
 - B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
 - 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 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.

3.4 RECYCLING CONSTRUCTION WASTE

A. Packaging:

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

B. 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.

3.5 DISPOSAL OF WASTE

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

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

B. Burning: Do not burn waste materials.

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

D. 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 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. Section 01 31 00 "Project Management and Coordination" for Web-based Project Information Management System.
 - 2. Section 01 32 33 "Photographic Documentation" for submitting final completion construction photographic documentation.
 - 3. Section 01 73 00 "Execution" for progress cleaning of Project site.
 - 4. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 5. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 6. Section 01 79 00 "Demonstration and Training" for requirements for instructing Owner's personnel.
 - 7. Divisions 03 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 DEFINITIONS

- A. List of Incomplete Items: Contractor prepared list of items to be completed or corrected, prepared for the Architect's use prior to Owner, Owner's Agent, and Architect's inspection (Design Team Punchlist), to determine if the Work is substantially complete.

1.3 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at time of request for Substantial Completion Inspection.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

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

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. "Substantial Completion" is the stage in the progress of Work when Work or designated portion thereof is sufficiently complete in accordance with Contract Documents so Owner can occupy or utilize Work for use which it is intended.
 - 1. Work will not be considered suitable for Substantial Completion review until all systems and equipment are operational; all designated or required governmental inspections and certifications have been made and posted, designated instruction of Owner's personnel in operation of systems and equipment has been completed, operation and maintenance data has been satisfactorily turned over to the Owner, and all finishes are in place. In general, the only remaining Work shall be minor in nature, such that the Owner could occupy project or designated portion thereof on following day, and completion of Work by Contractor would not materially interfere or hamper Owner's normal business operations.
 - 2. Contractor shall certify that all remaining Work will be completed within a reasonable time, agreed upon by Owner, following date of Substantial Completion. Failure of the Contractor to complete the Work within the stipulated time shall automatically re-institute the provisions for liquidated damages due Owner as contained elsewhere in Contract Documents, or as provided by law for such period of time as may be required by Contractor to fully complete Work whether Owner has occupied the Project or not.
- B. Contractor's List of Incomplete Items: Using Web-based Project Information Management Systems, prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- C. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - a. State accessibility standards inspection.
 - b. Accessibility standard inspection for compliance with ANSI A117.1, Americans with Disabilities Act Accessibility Guidelines (ADAAG) and local requirements if more stringent.

2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Construction Manager. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Construction Manager's signature for receipt of submittals.
 5. Submit test/adjust/balance records.
 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- D. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."
 6. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives, damage or settlement surveys, property surveys, and similar final record information.
 7. Advise Owner of changeover in heat and other utilities.
 8. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 10. Complete final cleaning requirements, including touchup painting.
 11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- E. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready

for final inspection and tests. On receipt of request and the Contractor's list of incomplete items, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

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

1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
 1. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 2. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 3. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A or substantially similar form, and forward to Architect at time of request for Substantial Completion inspection. Architect may use same form for Architect's supplemental items to Contractor.
 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.

- c. Name of Architect and Construction Manager.
 - d. Name of Contractor.
 - e. Page number.
4. Submit list of incomplete items in the following format:
- a. PDF electronic file. Architect, through Construction Manager, will return annotated file.

1.9 ACCESSIBILITY STANDARD INSPECTION

- A. Provide inspection at Substantial Completion of facility in accordance with rules and regulations of the Americans with Disabilities Act Accessibility Guidelines (ADAAG) for the purpose of determining compliance with ADAAG. Inspector must be licensed with the state fire marshal to perform the required inspection.
- B. Upon receipt of Inspector's report, immediately make corrections of any reported non-compliant items. Provide documentation to Owner of completed corrective measures.

1.10 OPERATION AND MAINTENANCE MANUALS

- A. Refer to Section 01 78 23.

1.11 PROJECT RECORD DOCUMENTS

- A. Refer to Section 01 78 39.

1.12 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file

with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.

- i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
 - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - q. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 01 50 00 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Section 01 91 13 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

1.2 DEFINITIONS

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

1.3 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.

- b. Enable inserted reviewer comments on draft submittals.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

1.4 COORDINATION

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

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

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

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Construction Manager.
 7. Name and contact information for Architect.
 8. Name and contact information for Commissioning Authority.
 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting

bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

2.3 EMERGENCY PROCEDURES MANUALS

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

2.4 OPERATION AND MAINTENANCE MANUALS

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

4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.
- 2.5 PRODUCT MAINTENANCE MANUALS
- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
 - C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
 - D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
 - E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
 - F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.
- 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS
- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
 - B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
 - C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION (Not Used)

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 Digital Data Files.
 - 3. Record Specifications.
 - 4. Record Product Data.
 - 5. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
 - 2. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Initial Submittal:
 - a. Submit PDF electronic files of Contractor's paper-copy set(s) of marked-up record prints.
 - b. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - 2. Final Submittal:
 - a. Submit PDF electronic files of scanned record prints.
 - b. Print each drawing, whether or not changes and additional information were recorded.
 - 3. Final Submittal:
 - a. Submit record digital data files.
 - b. Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Model: Comply with Owner's requirements.
- C. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- D. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- E. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

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. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets in red. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Architect for resolution.
 4. Architect will furnish Contractor with digital data files of the original Contract Drawings for use in recording information.
 - a. Architect makes no representations as to the accuracy or completeness of Electronic Drawings as they relate to the Contract Drawings.
 - b. Digital Data Software Program: The electronic files will be made available in the digital data software program in which they were produced by the Architect. Contractor is responsible for any necessary conversions to an alternate software program.
 - c. See Section 01 33 00 "Submittal Procedures" and "Electronic File Transfer Agreement" for requirements related to use of Architect's digital data files.
- C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Record 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.
 3. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.

- e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

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

2.3 RECORD PRODUCT DATA

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

2.4 MISCELLANEOUS RECORD SUBMITTALS

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

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

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 SUMMARY

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

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.
- B. Attendance Record: For each training module, submit list of participants.

1.3 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit within seven days of end of each training module.
 - 1. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals specified in Section 01 78 23 "Operation and Maintenance Data."

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

1.5 INSTRUCTION PROGRAM

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

- m. Special operating instructions and procedures.
 - 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
 - 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
 - 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning.
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
 - 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.
- 1.6 PREPARATION
- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data."
 - B. Set up instructional equipment at instruction location.
- 1.7 INSTRUCTION
- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
 - B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Owner will furnish Contractor with names and positions of participants.
 - C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner with at least 10 days' advance notice.
 - D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- F. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.8 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
- B. Digital Video Recordings:
 - 1. Submit video recording by method acceptable to Owner.
 - 2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.
 - 3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.

END OF SECTION

SECTION 01 83 18

SEISMIC REQUIREMENTS FOR NONSTRUCTURAL COMPONENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the seismic design and construction requirements for nonstructural elements including:
1. Suspended equipment or components in excess of 20 pounds.
 2. Wall or floor mounted equipment and/or components higher than 4 feet above finish floor in excess of 50 pounds.
 3. Wall or floor mounted equipment and/or components not higher than 4 feet above finish floor in excess of 200 pounds.
 4. Distribution systems in excess of 5 pounds per foot.
 5. Equipment or components listed in Related Sections below.

1.2 RELATED SECTIONS

- A. Nonstructural components, systems and equipment in the following specification sections shall also meet the requirements of this section.
1. Section 01 10 00 "Summary".
 2. Section 01 40 00 "Quality Requirements".
 3. Section 01 42 00 "References".
 4. Section 01 60 00 "Product Requirements".
 5. Section 01 77 00 "Closeout Procedures".
 6. Section 05 50 00 "Metal Fabrications"
 7. Section 08 41 13 "Aluminum Framed Entrances and Storefronts".
 8. Section 08 80 00 "Glazing".
 9. Section 09 51 00 "Acoustical Panel Ceilings".
 10. Division 11 Equipment Sections.
 11. Section 14 21 00 "Electric Traction Passenger Elevators".
 12. Division 22 Plumbing Sections.
 13. Division 23 Heating, Ventilating, and Air-Conditioning (HVAC) Sections.
 14. Division 26 Electrical Sections.
 15. Division 27 Communications Sections.

1.3 DEFINITIONS

- A. AHJ: Authority Having Jurisdiction.
- B. CDE: Component Design Engineer.

1.4 PERFORMANCE REQUIREMENTS

- A. Nonstructural seismic design in compliance with specified standards, performance requirements, material selections and requirements of this and related sections.
 - 1. Include nonstructural seismic design for components, equipment, systems associated bracing, connections, and anchorages to the structure.
 - 2. Include engineering analysis by a qualified CDE, using seismic performance requirements and design criteria indicated herein.
- B. The nonstructural design(s) shall be completed and submitted as a dedicated engineered design and shall not be added to, configured with, and/or contingent on the use of other nonstructural seismic bracing systems.
- C. Submit designs required in this section to the AHJ prior to construction.
- D. Conflicts within this specification section and/or other parts of the contract documents and/or governing code requirements, shall be identified in writing and shall be brought to the attention of the Owner and Architect as soon as discovered. Conflicts will be in favor of the more stringent requirement with the architect having the final authoritative decision.
- E. Systems identified in this section are to be deemed "designated seismic systems" per the IBC having a component importance factor of $I_p=1.25$ unless noted otherwise in this section.

1.5 REFERENCES

- A. Nonstructural components and their attachments to the structure shall meet the requirements of ASCE/SEI 7 including additional parameters as specified in this section.
- B. Pre-approvals, approvals, listings, evaluation reports, pre-engineered manuals and trade standards, from entities such as, but not limited to, Factory Mutual, ICC, NFPA, UL, ASME, SMACNA, Cisca shall not be considered as compliant to this section.
 - 1. Exception: Anchorage capacity designs for seismic restraints, vertical supports, and other connections to concrete, metal decking, structural steel, and other building structure connection points, shall be derived from appropriate ICC evaluation report data.

1.6 QUALITY ASSURANCE

- A. CDE Qualifications: Structural Engineer licensed in the State of Georgia and experienced in providing engineering services of the kind indicated that have resulted in the successful installations, similar in material, design, and extent to that indicated for this Project.

1.7 QUALITY ASSURANCE PLAN

- A. Submit a written Quality Assurance Plan per IBC section 1705.2 as modified in this section shall be submitted for the nonstructural item(s) to the AHJ and shall identify the following:
1. The elements, connectors, and anchorages critical to the seismic performance of a particular system, component, or equipment.
 2. Special Inspection and Testing shall be provided per sections 1704, 1707 and 1708 and other sections of the IBC. Periodic inspection shall be the minimum requirement for nonstructural components and shall be provided by the owner.
 3. Structural observations shall be performed. Allow for a minimum of 2 observations during construction. At the conclusion of construction, provide a written statement to verify that site visits were made and whether there are observed structural deficiencies that have not been resolved.
 4. Reporting frequency and distribution of testing, special inspection, and structural observation reports shall be identified. As a minimum, the distribution shall include the Contractor, AHJ, and Architect. Reports recording any deficiencies noted shall be delivered within 3 days of the observation.

1.8 CONTRACTOR'S STATEMENT OF RESPONSIBILITY

- A. Submit a written Contractor's statement of responsibility per IBC Section 1705.3 as modified in this section to the AHJ prior to the commencement of work on the system or component. The Contractor's statement of responsibility shall contain the following:
1. Acknowledgement of awareness of the special requirements contained in the quality assurance plan.
 2. Acknowledgment that control will be exercised to obtain conformance with the construction documents and/or approved shop drawings for the component that were approved by the AHJ.
 3. Procedures for exercising control within the Contractor's organization, the method and frequency of reporting and the distribution of the reports.
 4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

1.9 NONSTRUCTURAL SYSTEMS, EQUIPMENT AND COMPONENTS

- A. Nonstructural systems, equipment and components require a Quality Assurance Plan, Contractor's Statement of Responsibility, design by the CDE, submittals and construction per this section. Component design shall include seismic design of component, component restraint elements and connections as well as attachments to the primary structure.
- B. Nonstructural components in the specification sections noted above shall include interior and exterior wall construction, wall, floor and roof supported components as well as suspended systems, equipment and components as identified in Summary article.

- C. Request for omission of nonstructural design for a given system or item, must be submitted to the AHJ for review and acceptance. Omission request must include the following;
1. Referenced code language that Contractor believes to be supportive of requested seismic restraint omission.
 2. Shop drawings detailing system under omission request and other trades systems and services located within 10 feet of the requested system omission.
 3. An itemized statement identifying the dollar amount for materials, labor, etc., Contractor agrees to credit back to the owner for not having to install seismic restraints the Contractor should have included in their contract.

1.10 DESIGN CRITERIA

- A. Nonstructural design shall be provided based on ASCE 7 - Minimum Design Loads for Buildings and Other Structures, Section 9.6, using the following parameters:
1. Seismic Use Group III Per IBC Section 1616.2.
 2. Seismic Design Category D.
 3. $S_{DS} = 0.83$.
 4. $I_p = 1.25$.
 5. For the purposes of seismic design calculations, the base of the building shall be considered to be at the First Floor and the average roof height, with respect to the base, shall be **XXX'-0"** for the Main Building unless noted otherwise.
 6. F_p shall be determined in accordance with Equations 9.6.1.3-1, 9.6.1.3-2, and 9.6.1.3-3 of ASCE-7.
 7. Nonstructural components and systems shall be designed for the effects of combined horizontal and vertical earthquake forces in accordance with ASCE 7, Section 9.5.2.7.
- B. Coordinate nonstructural component weights, locations, and support requirements of supported components prior to submitting shop drawings.
- C. Design the nonstructural systems to accommodate horizontal deflection in any direction due to story drift. The calculated maximum inelastic story drifts with respect to the level below are:

D. BUILDING STORY DRIFTS

Level	Maximum Inelastic Story Drifts in each principal axis Direction with Respect to Level Below
Roof	2 - Inch
Main Level	.75 - Inch

- E. Nonstructural systems shall accommodate 3/4-inch vertical deflection of the structural frame, live loading, seasonal and day/night temperature ranges, and construction tolerances.

- F. Forces imposed on the structure by component anchorages shall be limited to the following maximum allowable point loads:
1. Loading on concrete slabs: 2,000 pounds vertically and 4,000 horizontally.
 2. Loading (other than parallel loading to beam axis not exceeding 2,000 pounds): not be applied to the bottom of beams.
 3. Transverse loading located at the top 1/3 of beam: 50 pounds.
 4. Lateral and or vertical loading on floor and roof deck: 100 pounds or 10 psf over the supported area including cumulative loads imposed by other nonstructural elements.
 5. Lateral loads applied to the top chord of roof joists: 50 pounds.
 6. Lateral loads: not applied to the bottom chord of roof joists.

1.11 CONNECTION TO STRUCTURE

- A. Seismic restraints or vertical supports shall not be welded to building steel unless approved by the project Structural Engineer. When approved by the project Structural Engineer drilled holes shall also be permitted for through-bolt seismic restraint or vertical support connection. Under no circumstance shall holes be torched or burned.
- B. Beam clamps (single and double flange mounts) shall not be used to make seismic restraint or vertical support connections. Exception – steel (non-cast) double flange mount beam clamps can be used to make (non-seismic) dead load only vertical support connections. Steel (non-cast) single flange mount beam clamps can be used to make (non seismic) dead load only vertical support connections, provided a retaining strap is installed on each individual beam clamp. Furthermore, retaining straps must be secured to the beam with a screw or shoot-in headed pin.
- C. Shoot-In, and powder / power driven pins, anchors, or fasteners shall not be used to make seismic restraint or vertical support connections to any type of concrete, concrete filled metal decking, etc. unless specifically approved by ICC, the CDE and AHJ for this use.
- D. Designs for drilled-in anchors to concrete shall use ICC evaluation report (without special inspection) allowable tension values. Installation shall be per the ICC evaluation report requirements.
- E. Concrete screws and large diameter screw-type concrete anchors shall not be used for connections to concrete filled metal decking.
- F. Cast-in-place inserts shall be constructed entirely of steel. Cast-in-place inserts shall be submitted to the architect for review and acceptance prior to installation.
- G. Use of, reference of, reproduction of, etc., building structure details, designs, assemblies, load rating, design capacities, etc., from NFPA shall not be considered compliance or qualification with the requirements identified within this project specification.

1.12 DETAILED SYSTEM REQUIREMENTS FOR SUSPENDED SYSTEMS

- A. The overall seismic restraint system design shall provide restraint in all directions, including vertical.

- B. Seismic restraints for suspended distribution systems shall not exceed the spacing identified below, provided the restraint design force imposed on the structure does not exceed capacities noted in Section 1.7 E above.
1. Single Hanger or Trapeze Supported Steel Piping and Conduit – Transversely 40 feet, Longitudinally 80 feet.
 2. Single Hanger Supported Copper Tubing and Cast-Iron Piping - Transversely 20 feet, Longitudinally 40 feet.
 3. Trapeze Supported Copper Tubing - Transversely 40 feet, Longitudinally 80 feet.
 4. Sheet Metal Ducting - Transversely 40 feet, Longitudinally 80 feet.
 5. Trapeze Supported Metal Cable Tray or Bus Duct - Transversely 40 feet, Longitudinally 80 feet.
 6. Center Hung or Single Hanger Supported Metal Cable Tray or Bus Duct - Transversely 40 feet, Longitudinally 80 feet.
 7. Equipment shall be seismically restrained at its installed location.
 8. Systems containing, Natural Gas, Fuel, Toxic, Combustible, Hazardous, Etc., shall have maximum restraint spacings limited to - Transversely 20 feet, Longitudinally 40 feet.
 9. Plastic piping, glass piping, fiberglass ducts, wire type trays, and other items not identified above shall have maximum restraint spacings limited to that identified in writing by the manufacturer of the item to be braced.
- C. Seismic restraints shall not be installed with brace angles greater than 60 degrees from the horizontal.
- D. The connection between the seismic restraint and the system / item(s) being restrained shall provide for load transfer. (Example; do not attach seismic restraint over pipe insulation– if pipe insulation is not rated to adequately transfer seismic design loads to restraint.)
- E. Seismic restraints shall not transmit gravity loads, induce uplift, or impose misalignment to the system or item being restrained.
- F. Seismic restraints shall be installed at, or within 4 inches of, a vertical support. Vertical support assembly shall be designed as part of the seismic restraint assembly.
- G. Longitudinal restraints may also act as transverse restraints if the restraint is installed within 24-inches of the 90 degree change in direction.
- H. Conduits, pipes, cable trays, ducts, etc., shall be positively attached to each braced or non-braced trapeze support.
- I. Multiple tiered or layered trapeze support configurations shall be seismically restrained at each individual tier or layer.
- J. Single hanger supported piping, tubing, conduits and Fire Protection sprinkler piping shall be supported at seismic restraint locations by standard duty, clevis hangers, J-hangers or seismic hanger clamps. Under no circumstance shall the use of other type hangers (i.e. band, ring, loop, light duty, extended, etc.) be allowed.

- K. Vertical support rod(s) at seismic restraint locations shall pass through the trapeze or hanger support and shall have hex nuts installed on both the bottom and the top sides of the support.
- L. Vertical support rods and connections to the building structure at the seismic restraint location shall be sized to resist calculated seismic tension and compression design loads.
- M. Vertical support rod(s) at seismic restraint locations (including Fire Protection sprinkler piping) shall be installed with rod stiffeners. Rod stiffeners may be omitted if the vertical support rod(s) at a given seismic restraint location have individual hanger rod lengths no greater than 45 times the rod diameter.
- N. Fire Protection sprinkler piping vertical hangers that have been installed to resist uplift from sprinkler head activation shall have rod stiffeners installed. Rod stiffeners may be omitted if the vertical supports in question have individual hanger rod lengths no greater than 45 times the rod diameter.
- O. Seismic restraints for Fire Protection sprinkler piping shall be engineered (sealed and signed) by the CDE, to fully comply with the requirements of this specification.
- P. Use of, reference to, reproduction of, etc., seismic restraint details, designs, assemblies, load rating, design capacities, etc., from NFPA shall not be considered compliance or qualification with the requirements identified within this project specification.
- Q. Seismic restraint designs and installations for vibration isolated systems can use either rigid or flexible brace arm members. Do not mix rigid and flexible brace arms at a given restraint location.
- R. Seismic restraint designs and installations for vibration isolated systems shall use flexible (7x19) stainless steel aircraft cable. Individual seismic restraint cables shall be installed with the proper amount of slack, so installed cable restraints do not inhibit the normal operation of the vibration isolation devices.
- S. Proper amount of slack and means and methods to install, measure and inspect for proper amount of cable slack, shall be determined by and identified in writing by the vibration isolation manufacturer the Contractor has chosen, not the CDE. Provide a copy of this written information with the (As Built / Record Drawings) that are to be submitted prior to inspection.
- T. Vibration isolation devices for suspended applications shall be connected directly to the underside of the building structure and not from hanger rod.
- U. Vertical supports suspended from the vibration isolation device shall include limit stops, designed by the vibration isolation device manufacturer to prevent over-travel.
- V. Seismic restraints shall be designed to account for hydro dynamic forces and thermal expansion and contraction.

1.13 ACTION SUBMITTALS

- A. Shop Drawings: Shop drawings shall be submitted for elements requiring seismic design per this section of these specifications. These include, but are not limited to, seismic bracing for equipment, conveyances, and architectural components; seismic restraints of vibration isolation systems; and details of seismic bracing and

attachment systems designed to accommodate differential seismic movement between building levels.

- B. Structural Calculations: Submit calculations sealed and signed by the CDE responsible for their preparation, verifying that elements requiring seismic design per these specifications meet the stated requirements. These calculations are for information only unless found to be non-compliant and will not be stamped as reviewed or returned to the submitter. Calculations shall include the following design installation data for each individual design application. Item Description, Weight, Number Of Vertical Supports, Vertical Support Size, Restraint / Brace Spacing, Restraint / Brace Type, Restraint / Brace Lay Out Pattern, and Restraint / Brace To Structure Connection Detail Reference.
- C. Quality Assurance Plan: Submit a Quality Assurance Plan for nonstructural items requiring seismic design per this section. Quality assurance plan shall comply with the International Building Code and ASCE 7 as modified in this section.
- D. Contractor's Statement of Responsibility: Submit in accordance with the IBC Section 1705.3 as modified in this section. Where IBC Section 1705.3 references "special requirements of the quality assurance plan," substitute "special requirements of the quality assurance plan as incorporated into the contract documents.

1.14 INFORMATIONAL SUBMITTALS

- A. Component Certification: Mechanical and electrical components shall meet the Component certification requirements of ASCE 7, Section 9.6.3.6, and IBC section 1707.7.3 including submission of manufacturer's certificates of compliance for review by the AHJ.
- B. After installation of the seismic restraints, but prior to final inspection, submit Record Drawings identifying actual installed seismic restraint locations and layouts.
- C. The CDE shall submit to the Contractor and AHJ as one package, as a complete nonstructural bracing submittal.
- D. Submit Fire Protection sprinkler piping systems to the local AHJ for review and approval prior to submittal to Architect. Include with the submittal to the AHJ a cover letter stating:
 - 1. Fire Protection sprinkler piping system has been engineered, signed, and sealed by the CDE to meet the requirements of this section.
 - 2. Fire Protection sprinkler piping system has been submitted to, reviewed and accepted by the project system CDE and the Architect as required by the approved and permitted construction documents.
 - 3. Review and acceptance of the Fire Protection sprinkler piping system by the project system CDE and Architect is limited to the design of the seismic restraints and the effects these seismic restraints will impart to the supporting building structure and components.
 - 4. Review and acceptance of the Fire Protection sprinkler piping system by the project system CDE did not include or cover the design integrity or code compliance of the general design and service aspects (i.e. flow, coverage, pressure, size, etc.) of the Fire Protection sprinkler piping system.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Products used in the bracing of nonstructural elements, components and equipment shall comply with this section.
- B. Seismic bracing components shall include, but shall not be limited to the following:
 - 1. Seismic brackets.
 - 2. Rod stiffener clamps/brackets.
 - 3. Strut.
 - 4. Strut nuts.
 - 5. Aircraft cable.
 - 6. Cable clamps/fittings.
 - 7. Anchors.
 - 8. Bolts.
 - 9. Hex nuts.
 - 10. Washers.
 - 11. Threaded rod.
 - 12. Hangers.
 - 13. Strut clamps.
- C. Interior application components shall be commercial grade steel with a minimum electrogalvanized zinc coating thickness of 0.5 mils.
- D. Exterior and special interior environment applications as specified; seismic restraint components shall be 316 Stainless Steel.
- E. Seismic hardware brackets shall have manufacturer identified service load capacities signed and sealed by an independent registered Structural Engineer. Service load capacities shall be derived from independent lab testing of a seismic hardware bracket as an assembly. Seismic hardware brackets shall completely enclose or encircle the rod, anchor, bolt, fastener, etc.
- F. Vibration seismic hardware brackets shall be designed and manufactured such that the connection assembly remains integral without becoming loose due to system vibrations.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Quality Assurance Plan and Contractor's Statement of Responsibility.
- B. Do not install seismic restraints prior to review and acceptance by the CDE and AHJ.

- C. Notify the CDE and any required Special Inspector(s) a minimum of 7 days prior to installation of component restraint installation.
- D. Secure components to structure, concrete bases, or special supports per approved shop drawing.
- E. Coordinate and resolve seismic restraint conflicts with other trades in a timely manner to avoid impacting project schedule.
- F. Seismic restraint systems shall not interfere with installation of other building systems and access space as indicated on drawings.
- G. Upon completion of component, system, or equipment installation, the CDE shall provide structural observation per the Quality Assurance Plan requirements of this section.

END OF SECTION

SECTION 01 91 13

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.

1.2 DEFINITIONS

- A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- B. CxA: Commissioning Authority.
- C. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.3 COMMISSIONING TEAM

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

1.4 OWNER'S RESPONSIBILITIES

- A. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.
- B. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.5 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 on a variable basis.
 - 4. Integrate and coordinate commissioning process activities with construction schedule.
 - 5. Review and accept construction checklists provided by the CxA.
 - 6. Complete paper construction checklists as Work is completed and provide to the Commissioning Authority on a monthly basis.
 - 7. Review and accept commissioning process test procedures provided by the Commissioning Authority.
 - 8. Complete commissioning process test procedures.

1.6 CxA'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Provide commissioning plan.
- C. Convene commissioning team meetings.
- D. Provide Project-specific construction checklists and commissioning process test procedures.
- E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.
- F. Prepare and maintain the Issues Log.
- G. Prepare and maintain completed construction checklist log.
- H. Witness systems, assemblies, equipment, and component startup.
- I. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 01 10 00 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 01 56 39 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
3. Section 01 73 29 "Cutting and Patching" for cutting and patching procedures.
4. Section 31 10 00 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.2 DEFINITIONS

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

1.3 MATERIALS OWNERSHIP

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

1.4 PREINSTALLATION MEETINGS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Engineering Survey: Submit engineering survey of condition of building.
- C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- D. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Comply with Section 01 32 33 "Photographic Documentation." Submit before Work begins.
- F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

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

1.7 QUALITY ASSURANCE

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

1.8 FIELD CONDITIONS

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

1.9 COORDINATION

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

- B. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
 - 1. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

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

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

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

3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 5. Maintain fire watch during and for at least half an hour after flame-cutting operations.
 6. Maintain adequate ventilation when using cutting torches.
 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 10. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 74 19 "Construction Waste Management and Disposal."
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- 3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS
- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- 3.7 DISPOSAL OF DEMOLISHED MATERIALS
- A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 01 74 19 "Construction Waste Management and Disposal."
1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.

3.8 CLEANING

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

END OF SECTION

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes formwork, shoring, reshoring, backshoring, falsework, bracing, and other temporary supports required to form and support all cast-in-place concrete shown on the drawings.
- B. Related Requirements:
 - 1. Specification 01 45 29 "Structural Testing and Inspections" for inspection requirements associated with forming and accessories.
 - 2. Specification 01 81 13 "Sustainable Design Requirements" for sustainable design requirements.
 - 3. Specification 03 20 00 "Concrete Reinforcing" for reinforcement associated with cast-in-place concrete.
 - 4. Specification 03 30 00 "Cast-in-Place Concrete" for cast-in-place concrete and related products.

1.3 REFERENCES

- A. Definitions:
 - 1. Backshores: Shores placed snugly under a stripped concrete structural member after the original formwork and shores have been removed from a small area without allowing the structural member to deflect or support its own weight or superimposed construction loads. It is assumed that backshores carry the same load as that carried by the original shores they replace.
 - 2. Formwork: The total system of support for freshly placed concrete, including the mold or sheathing that contacts the concrete and all supporting members, hardware, and necessary bracing.
 - 3. Professional Engineer: A professional engineer who is licensed to practice engineering in the state where the project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with concrete formwork that are similar to that indicated for this Project in material.

4. Reshores: Shores placed snugly under a stripped concrete structural member after the original forms and shores have been removed from the member, thus requiring the member to carry its own weight and superimposed construction loads at the time of installation. Reshores are assumed to carry no load at the time of installation. After the installation of reshores, superimposed construction loads are assumed to be distributed among all members connected by reshores.
5. Shores: Vertical or inclined support members designed to carry the weight of formwork, concrete, and construction loads above.

B. Reference Standards:

1. Comply with the provision of the following codes, specifications, and standards except where more stringent requirements are shown or specified:
 - a. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
 - b. ACI 301 - Specifications for Structural Concrete.
 - c. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
 - d. ACI 347R - Guide to Formwork for Concrete; 2014.
 - e. ASME A17.1 - Safety Code for Elevators and Escalators; 2013.
 - f. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
 - g. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
 - h. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.
 - i. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.
 - j. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2015a.
 - k. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
 - l. PS 1 - Structural Plywood; 2009.
 - m. CRSI, "Manual of Standard Practice."

1.4 RESPONSIBILITY

- A. The design, construction, and safety of all formwork shall be the responsibility of the Contractor. All forms, shores, reshores, backshores, falsework, bracing, and other temporary supports shall be engineered to support all loads imposed including the wet weight of concrete, construction equipment, live loads, lateral loads due to wind and wet concrete imbalance. The Contractor shall also be responsible for determining when temporary supports, shores, reshores, backshores, and other bracing may be safely removed.

1.5 SUBMITTALS

- A. Product Data: Submit technical data and brochures for carton forms.
- B. Shop Drawings:
 - 1. Formwork Drawings: Formwork drawings, prepared under the supervision and sealed by the formwork design engineer, shall be submitted for Owner's record and shall be reviewed by the Engineer for conformance to structural layout only. Such shop drawings shall indicate all dimensions and types of materials, sizes, lengths, connection details, design allowance for construction loads, anchors, form ties, shores, braces, construction joints, reveals, camber, openings, formwork coatings, and all other pertinent information.
 - 2. Shoring Plan: Submit drawings to indicate the number of levels of shoring, proposed time and sequence of formwork and shore removal, minimum concrete strength for stripping of forms and shore removal, assumed construction loads, amount and layout of shores (specify whether backshores or reshores), and length of time shores are to be left in place. This plan shall be strictly followed by the Contractor. Shoring plans are to be submitted for Owner's record only and will not be reviewed or returned.
- C. Temporary Structure Design Submittals: Submit the following items for the Owner's records:
 - 1. Design Calculations: Submit, for record purposes, calculations of all concrete formwork sealed by the formwork design engineer.
- D. Sustainable Design Submittals:
 - 1. Low-Emitting Materials – IEQ Credit 4: Submit manufacturer data sheets for all paints and other coatings outlined in this section. Data sheets shall include the manufacturer's name, product name, reference ASTM specifications, other pertinent product information, and specific VOC data for each product as the corresponding VOC from the referenced standard.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Licensed Professionals: The formwork design engineer retained by the Contractor shall be a professional engineer registered in the state where the project is located and shall be experienced in the design of concrete formwork.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Unless otherwise specified, formwork for exposed concrete surfaces as defined by the Surface Finish Class noted on the

drawings, shall consist of plywood, metal, metal framed plywood, or other acceptable surface. Formwork shall provide a continuous straight and smooth surface conforming to the joint system as specified on the Architect's drawings. Form material shall have sufficient thickness to withstand pressure of concrete without bow or deflection. Plywood shall be exterior grade plywood panels, suitable for concrete forms, complying with U.S. Product Standard PS-1, each piece bearing a legible inspection trademark, and as follows:

1. [Medium Density Overlay on Hardwood Face, Class 1 or better, mill-release agent treated and edge sealed.]

B. Non-specific formed concrete: Unless otherwise specified, the default finish for formed surfaces shall be rough-form finish constructed with plywood, lumber, metal, or other acceptable material. Lumber shall be dressed on at least two edges and one side for tight fit. The minimum grade shall be B-C, exterior grade.

2.2 FORMWORK COATINGS

A. Formwork coatings shall be of a commercial formulation that will not bond with, stain, nor adversely affect concrete surfaces or impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede curing with water or curing compounds. Provide a product that has a maximum VOC (Volatile Organic Compounds) of 50 g/l but not greater than that permitted by the local government agency having jurisdiction in the area where the project is located.

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

1. Dayton Superior; Clean Strip J1EF.
2. Dayton Superior; Farm Fresh XL.
3. W.R. Meadows; Duogard II.

2.3 NAILS AND FASTENERS

A. Use only galvanized nails and fasteners for securing formwork in structures exposed to weather or unconditioned spaces such as garages, canopies, and porte-cocheres.

2.4 FORM TIES

A. Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to minimize spalling of concrete on removal.

1. Exposed Surfaces: For surfaces designated with Surface Finish Class SF-2.x or SF-3.x, furnish units that will leave no portion of the tie closer than 3/4 inch to the plane of the concrete surface and that will leave holes not larger than one inch in diameter in concrete surface when the ends or end-fasteners have been removed.
2. Dampproofed Surfaces: Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

3. Exposed to Weather or Unconditioned Space: Provide removable, glass-fiber-reinforced plastic, stainless steel, or galvanized form ties that will leave no corrodible metal closer than 1 1/2 inches in surfaces that will be exposed to weather or in an unconditioned space in the final structure. The ties shall leave holes no larger than one inch in diameter in concrete surfaces when the ends or end-fasteners are removed.

2.5 CHAMFER STRIPS

- A. Provide wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

PART 3 - EXECUTION

3.1 FABRICATION AND CONSTRUCTION

- A. Design, erect, support, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic construction loads that might be applied until the concrete structure can support such loads.
 1. The formwork design engineer shall design the concrete formwork, formwork removal, shoring, reshoring, and backshoring.
- B. 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 concrete mortar.
- C. 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 steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
- D. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and patch forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- F. Chamfer exposed corners and edges as indicated, using specified chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- G. 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.

3.2 CLEANING AND TIGHTENING

- A. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and all other debris just prior to concrete placement. Retighten forms and bracing prior to concrete placement as required to prevent concrete mortar leaks and maintain proper alignment.

3.3 TOLERANCES

- A. Unless specified otherwise, all tolerances for concrete formwork shall conform to ACI Standard 117, "Standard Tolerances for Concrete Construction and Materials". Before concrete placement the Contractor shall check lines and levels of erected formwork and make any corrections and adjustments as required to ensure proper size and location of concrete members and stability of forming systems. During concrete placement the Contractor shall check formwork and supports to ensure that forms have not displaced and that completed work will be within specified tolerances.
- B. Construct forms so as to limit the offset between adjacent pieces of formwork facing material in accordance with the surface tolerance class as defined in ACI 117 corresponding to the Surface Finish Class noted on the drawings. The offset limits shall apply to both abrupt and gradual variations in the surface.
- C. Prior to each concrete pour, the Contractor shall engage a qualified surveyor to verify that work is within specified tolerances. The surveyor shall report in writing to the Architect, Engineer and Contractor certifying that the work is acceptable or indicating any deviations from allowable tolerances.
- D. The Owner shall hire an independent qualified surveyor to verify the proper form, line, position, and elevation of the finished concrete work. The results of each survey shall be sent to the Owner, Architect/Engineer, and Contractor and shall identify any deviation from specified tolerances. All work not in conformance with specified tolerances shall be removed at the Contractor's sole expense if so specified by the Owner.

3.4 SHORES AND SUPPORTS

- A. Comply with requirements of ACI 301 for shoring, reshoring and backshoring in concrete construction and as herein specified where more stringent.

3.5 REMOVAL OF FORMS AND SUPPORTS

- A. Determination by Contractor's Registered Engineer: The Contractor's registered professional engineer shall determine and submit for Owner's record the time and sequence of formwork and shore removal subject to the criteria as specified below.

The submittal shall clearly distinguish between reshoring and backshoring procedures.

- B. Determining in situ Strength of Concrete: The General Contractor shall be responsible for making and curing concrete cylinders, cured under field conditions, for the purpose of determining concrete strength at time of form and shore removal. Such cylinders shall be made by the Contractor and tested by his testing laboratory. Alternatively, the in situ strength of concrete may be determined by the Maturity Method following the requirements of ASTM C 1074. An acceptable system for this method is the "intelliRock" system manufactured and supplied by Engius Constructive Intelligence of Stillwater, OK.
- C. Records of Weather Conditions: The Contractor shall be responsible for keeping records of weather conditions to be used in the decision on when to remove forms.
- D. Formwork Not Supporting Concrete: Formwork not supporting concrete, such as sides of beams, walls, columns and similar parts of the structure, may be removed after cumulatively (not necessarily consecutively) curing at not less than 50°F for 12 hours after placing concrete, provided the concrete is sufficiently hard so as not to be damaged by form removal operations and provided curing and protection operations are maintained. If ambient air temperatures remain below 50°F, if retarding agents are used, or if Type II and Type V Portland cement is used, then this specified minimum period shall be increased as required to safely remove the forms without damage to the concrete. Where such forms also support formwork for slab or beam soffits, the removal times of the latter shall govern.

3.6 FIELD QUALITY CONTROL

- A. Field Inspection: Refer to Specification 01 45 29 "Structural Testing and Inspections" for inspection requirements associated with forming and accessories.

END OF SECTION 03 10 00

SECTION 03 20 00
CONCRETE REINFORCING

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 work of this section.

1.2 SUMMARY

- A. Section includes labor, materials, hardware, equipment, transportation and services required to fabricate and place all reinforcement for cast-in-place concrete including bars, welded wire reinforcement, ties and supports shown on the drawings and as specified. Prestressing reinforcement is specified in Precast Concrete sections of the specifications.
- B. Related Requirements:
1. Specification 014529 "Structural Testing and Inspections" for testing and inspection requirements associated with concrete reinforcing.
 2. Specification **018113** "Sustainable Design Requirements" for sustainable design requirements.
 3. Specification 031000 "Concrete Forming and Accessories" for forming associated with cast-in-place concrete.
 4. Specification 033000 "Cast-in-Place Concrete" for cast-in-place concrete and related products.

1.3 REFERENCES

- A. Reference Standards:
1. Comply with all provisions of the following codes, specifications, and standards except where more stringent requirements are shown or specified:
 - a. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 - b. ACI 301, "Specifications for Structural Concrete for Buildings."
 - c. ANSI/AWS D1.4, "Structural Welding Code – Reinforcing Steel."
 - d. CRSI, "Manual of Standard Practice."

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Quality Control: The Contractor is responsible for quality control, including workmanship and materials furnished by subcontractors and suppliers.
2. Document Conflict and Precedence: In case of conflict among documents, including architectural and structural drawings and specifications, notify the Architect/Engineer prior to submitting proposal. In case of conflict between and/or among the structural drawings and specifications, the strictest interpretation shall govern, unless specified otherwise in writing by the Architect/Engineer.

- B. Preinstallation Meetings: The Reinforcing-Placing subcontractor shall attend the Pre-Concrete Conference conducted by the Concrete Contractor as described in Specification 033000 "Cast-in-Place Concrete."

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items including mechanical splices, hooked anchorage systems, large-headed stud punching shear reinforcement, dowel bar replacement systems, and dowel bar sleeves. For fiber reinforcement, submit manufacturer's product data, including application rate and mixing instructions.
- B. Shop Drawings:
1. Submit shop drawings for all reinforcing steel and related accessories for the Engineer's approval. Shop drawings shall show arrangement and layout, bending and assembly diagrams, bar schedules, stirrup spacing, splicing and laps of bars and shall be prepared in accordance with CRSI Standards.
- C. Certificates:
1. Submit, for record, mill certificates and/or test results signed by Producer, for all reinforcement.
 2. Provide certification from fiber reinforcement manufacturer that fiber reinforcement complies with specified requirements.
- D. Test and Evaluation Reports:
1. Submit International Code Council (ICC) Evaluation Service Reports indicating approval from ICC Evaluation Service, Inc. for mechanical splices, hooked anchorage systems, large-headed stud punching shear reinforcement and dowel bar replacement systems.
- E. Sustainable Design Submittals:
1. Recycled Content – **MR Credit 4**: Submit documentation indicating percentages of post-consumer and pre-consumer recycled content by weight per unit of product or assembly containing the product. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.
 2. Regional Materials – **MR Credit 5**: Submit documentation indicating location and distance to project site of extraction, harvesting, recovery, and

manufacturing of all materials. Indicate the dollar value of the material cost of the product containing local/regional materials. Where product components are sourced or manufactured in separate locations, provide location and percentage by weight of each component per unit of product. This documentation is only required when the distance to the project site is 500 miles or less.

3. Low-Emitting Materials – **IEQ Credit 4**: Submit manufacturer data sheets for all coatings outlined in this section. Data sheets shall include the manufacturer's name, product name, reference ASTM specifications, other pertinent product information, and specific VOC data for each product as the corresponding VOC from the referenced standard.

F. Qualification Statements: Submit welding certificates.

1.6 QUALITY ASSURANCE

- A. Welder Qualifications: Qualify procedures and personnel according to ANSI/AWS D1.4.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Reinforcement:

1. Reinforcing materials shall be delivered from the mill in bundles that are identified as to heat number and manufacturer and accompanied with mill and analysis test reports and an affidavit from the supplier stating that the material conforms to the requirements of the governing ASTM specification listed herein.
2. Reinforcing Bars: Reinforcing bars shall conform to ASTM A 615, Grade 60 or Grade 80 as noted on the drawings.
3. Reinforcing Steel: Reinforcing steel used as transverse reinforcing or as spiral reinforcing as noted on the drawings shall conform to ASTM A 1035.
4. Weldable Reinforcing Bars: All reinforcing bars noted on the drawings as being required to be welded shall conform to ASTM A 706, Grade 60.
5. Deformed Bar Anchors: 3/8" to 5/8" diameter AWS Type C studs manufactured in conformance with ASTM A 1064 with a minimum yield strength of 70,000 psi and a tensile strength of 80,000 PSI. 3/4" or larger diameter, ASTM A 706 bars of equal size with welds to steel substrate that develop the full strength of the anchor. ASTM A 615 reinforcing bars may not be substituted for deformed bar anchors. Reinforcement shall be approved by the ICC-Evaluation Service, Inc and shall have the Evaluation Service Report submitted for Engineer review. The following are acceptable products, provided that their Evaluation Service Reports are still valid at the time of intended use on the project:
 - a. Nelson Stud Welding, Inc.; Nelson D2L Deformed Bar Anchor Studs (ESR-2907).
 - b. Tru-Weld Division, TFP Corporation; Deformed Bar Anchors (ESR-2823).

6. Plain Steel Welded Wire Reinforcement: ASTM A 1064 with a yield strength of 65,000 PSI. Provide in flat sheets only.
7. Deformed-Steel Welded Wire Reinforcement: ASTM A 1064 with a yield strength of 70,000 PSI. Provide in flat sheets only.
8. Wire: Smooth wire for spiral reinforcement shall conform to ASTM A 82 with a minimum yield strength of 70,000 PSI.
 - a. Studs:
 - 1) Nelson Stud Welding Inc.; Nelson Punching Shear Resistor Studs (ESR-1170).
 - 2) Tru-Weld Division, TFP Corporation; Tru-Weld Punching Shear Resistor Studs (ESR-2822).

2.2 SPLICES

A. Mechanical Tension Splices:

1. Mechanical splices shall conform to Type 1 splices.
 - a. Type 1 splice shall develop, in tension and compression, 1.25 times the specified yield strength of the splice bar.
2. Splices shall be approved by the ICC-Evaluation Service, Inc and shall have the Evaluation Service Report submitted for Engineer review.
3. The bar ends that are to attach to the splice shall be prepared and installed in accordance with the manufacturer's requirements.
4. The following are acceptable mechanical tension splices (splices qualified for use with grade 80 bars are parenthetically noted), provided that their Evaluation Service Reports are still valid at the time of intended use on the project:
 - a. BarSplice Products, Inc.; BPI-Grip XL System (ESR-2299). (Type 1 or Type 2)
 - b. BarSplice Products, Inc.; Taper Threaded Grip-Twist System (ESR-2299). (Type 1 or Type 2)
 - c. BarSplice Products, Inc.; Position Taper Threaded Grip-Twist System (ESR-2299). (Type 1 or Type 2)
 - d. Headed Reinforcement Corporation; HRC 500/510 Xtender Mechanical Coupler System (ESR-2764). (Type 1 or Type 2)
 - e. Dayton Superior Corporation; DBDI Reinforcing Bar Mechanical Splice System (ESR-2649). (Type 1 or Type 2).
 - f. Dayton Superior Corporation; Bar-Lock Coupler Systems for Splicing Reinforcement Bars, S-Series (ESR-2495). (Type 1)
 - g. Dayton Superior Corporation; Bar-Lock Coupler Systems for Splicing Reinforcement Bars, L-Series (ESR-2495). (Type 1 or Type 2)
 - h. Dayton Superior Corporation; Taperlok Reinforcing Bar Mechanical Splice Couplers (ESR-2481). (Type 1 or Type 2)
 - i. Dextra Manufacturing Co., Ltd.; Bartec Mechanical Splice System for Steel Reinforcing Bars in Concrete (ESR-1705). (Type 1 or Type 2)

- B. Dowel Bar Replacement: All grade 60 reinforcing steel dowel bars shown on the drawings crossing concrete construction joint surfaces with inserts cast flush against the form and having reinforcing bars connected to the insert in a subsequent concrete pour shall conform to the following:
1. Splice connection to the insert shall develop the 1.25 times the specified yield strength and the full tensile strength of the spliced bar.
 2. Splices shall be approved by the ICC Evaluation Service, Inc. as expressed in an ICC Evaluation Service Report which shall be submitted for review.
 3. The following are acceptable products (for use only with grade 60 bars), provided that their Evaluation Service Reports are still valid at the time of intended use on the project:
 - a. Dextra Manufacturing Co., Ltd.; Bartec Mechanical Splice System for Steel Reinforcing Bars in Concrete (ESR-1705).
 - b. nVent Electric, plc.; Lenton Form Saver SA (IAPMO-UES 0129).
- C. Hooked Anchorage Replacement: Reinforcing bar terminations shall be manufactured out of ASTM A 576, ASTM A 615, or A 706 material and shall develop the full tensile strength of the bar when installed at the manufacturer's recommended depth.
1. The anchorage shall be approved by the ICC Evaluation Service Inc. as expressed in an ICC Evaluation Service Report which shall be submitted for review.
 2. The following are acceptable products (for use only with grade 60 bars), provided that their Evaluation Service Reports are still valid at the time of intended use on the project:
 - a. Dextra Manufacturing Co., Ltd; Bartec Mechanical Anchorages for Steel Reinforcing Bars in Concrete (ESR-2166).
 - b. Headed Reinforcement Corporation; HRC 555 Headed Reinforcing Bars (ESR-2935).
 - c. Headed Reinforcement Corporation; HRC 670 HeadLock (IAPMO-UES 0177).
 - d. nVent Electric plc.; Lenton Terminator (IAPMO-UES 0188).
 - e. nVent Electric plc.; Lenton Ultimate (IAPMO-UES 0188)

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: Smooth bars used to dowel across slab-on-grade construction joints shall conform to ASTM A 615, Grade 40 or ASTM A 36, plain-steel bars. Cut bars true to length with ends square and free of burrs.
- B. Epoxy-Coated Joint Dowel Bars: Smooth epoxy-coated bars used to dowel across slab-on-grade construction joints shall conform to ASTM A 775 with ASTM A 615, Grade 40 or ASTM A 36 plain-steel bars. Cut bars true to length with ends square and free of burrs.
- C. Dowel Bar Sleeves: Plastic or gage metal (26 gauge minimum) sleeves with an inside diameter of 1/16 inch greater than the dowel bar that it encases, that have

the strength, durability, and design to provide free movement of the dowel relative to the concrete slab and that are specifically manufactured for this purpose.

- D. Alternate Slab-on-Grade Joint Load Transfer Systems: A system that consists of flat, ASTM A 36 plate that is saw cut into a square or rectangular shape and is embedded into or encased by a plastic sleeve that allows movement in both lateral directions but not in the vertical direction. Acceptable systems are manufactured by PNA Construction Technologies with products known by the names "Diamond Dowel System" and "PD³ Basket" and Greenstreak Group Inc. with products known as "Speed Plate" and "Double-Tapered Basket".
- E. Tie Wire: Tie wire shall be annealed steel tie wire, minimum 16 gauge.
- a. Tie wire in architecturally exposed concrete shall be plastic coated or stainless steel.
 - b. Tie wire for epoxy-coated reinforcement shall be epoxy-coated.
 - c. Tie wire for galvanized reinforcement shall be galvanized.
- F. Holding Wire: Holding wire shall conform to ASTM A 82 or ASTM A 1064.
- G. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Use wire bar type supports complying with CRSI recommendations.
1. Slabs-on-Grade: Use precast concrete bar supports (dobies) or supports with sand plates or horizontal runners designed for use on ground.
 2. Spread Footing Bottom Reinforcement: Use precast concrete bar supports (dobies) or chairs designed for soil-supported slabs.
 3. Mat Foundation: Use precast concrete bar supports (dobies), chairs designed for soil-supported slabs, or cast-in-place concrete curbs.
 4. Exposed to View Concrete: Provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
 5. Support of Epoxy-Coated Reinforcement: Provide epoxy-coated or other dielectric-polymer-coated wire bar supports to support epoxy-coated reinforcement.
 6. Support of Galvanized Reinforcement: Provide galvanized wire bar supports to support galvanized reinforcement.

2.4 ALTERNATES:

1. Products Requiring International Code Council (ICC) Evaluation Service Reports:
 - a. For those products listed in Part 2 as requiring Evaluation Service Reports (ESRs), alternate products that do not have ESRs will be considered by the Engineer only if valid research reports or test data from an independent and approved agency is provided and use of the product receives prior approval from the Building Official.

PART 3 - EXECUTION

3.1 FABRICATION AND DELIVERY

- A. Bending and Forming: Fabricate bars of indicated sizes and accurately form to shapes and lengths indicated and required, by methods not injurious to materials. Do not heat reinforcement for bending. Bars shall be free from injurious defects, have a workman-like finish with no excessive rust and/or pitting, and have no unusual kinks or bends.
- B. Marking and Shipping: Bundle reinforcement and tag in accordance with Section 7.4.5 of the CRSI "Manual of Standard Practice." Transport and store at site so as not to damage material. Keep sufficient supply of tested, approved, and proper reinforcement at the site to avoid delays. Maintain reinforcing bars free of mud, dirt, grease, or other coating.

3.2 PLACING REINFORCEMENT

- A. Comply with CRSI recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports and as herein specified.
- B. Before placing reinforcement and again before concrete is placed, clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by chairs, runners, bolsters, spacers, and hangers as required. Exercise particular care to maintain proper distance and clearance between parallel bars and between bars and forms. Provide spreaders and spacers to hold steel in position. Support steel at proper height upon approved chairs.
- D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set tie wires so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Support of Column and Wall Reinforcing Steel:
 - 1. It is the responsibility of the contractor to ensure that all reinforcing assemblies have adequate strength and stability to resist loads imposed during construction.
- F. Support of Spread Footing Reinforcing Steel:
 - 1. Bottom Steel: Support bottom reinforcing mat to provide the specified clearance to the bars. Spacing between supports shall not exceed 4'-0" centers each way.
 - 2. Top Steel: Support top reinforcing on steel angle frames braced in both directions or on special standee support bars. Spacing between supports shall not exceed 4'-0" centers each way. The depth of the supports shall

provide the specified clearance from the bars to the top of the concrete. The design of the support steel shall be the responsibility of the Contractor.

- G. Install welded wire reinforcement in as long lengths as practicable. Provide lap splice for wires of adjoining pieces per ACI 318 Chapter 25.5.3 or 25.5.4 and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.
- H. Coordinate with other trades and expedite materials and labor to avoid omissions and delay.
- I. Install waterproof membrane or vapor retarder as specified prior to placing steel for concrete slabs-on-grade.
- J. Extend reinforcement continuous through construction joints unless otherwise shown on the drawings.
- K. Slab-on-Grade Joint Dowel Bars: Support slab-on-grade joint dowel bars independently of support for slab reinforcement on soil supported slab bolsters or specially manufactured cradles such that dowel bar remains parallel to slab surface and at right angles to joint during concreting operations. Lightly coat the exposed end of the dowel with a paraffin-base lubricant, asphalt emulsion, form oil, or grease or use a dowel bar sleeve.
- L. Alternate Slab-on-Grade Joint Load Transfer Systems: Install the alternate load transfer system in accordance with the manufacturer's instructions such that the largest plane of the flat plate is parallel to the plane of the subgrade on which the slab is bearing.
- M. Provide and place additional reinforcing steel at all sleeves and openings in beams, slabs, and walls as specified on the drawings. Where sleeves or openings not shown on the drawings interrupt the reinforcement, consult with Engineer for instructions for placing and splicing of bars. Provide required additional reinforcing steel at no additional cost to the Owner.
- N. Do not bend reinforcement that is embedded partially in concrete except in locations noted on the drawings or approved by the Engineer.

3.3 SPLICING REINFORCING STEEL

- A. Provide splices as indicated on the drawings. Splice reinforcing bars only at locations shown on the structural drawings and approved shop drawings. Unauthorized or unscheduled splices not approved by the Engineer in writing will not be accepted.
- B. All lap splices in reinforcing steel shall be contact lap splices unless detailed otherwise on the drawings.
- C. Maintain proper cover and spacing between reinforcing bars at splices.
- D. Lap unscheduled reinforcing bars not otherwise specified with a Class B lap splice. Lap welded wire reinforcement per ACI 318 Chapter 25.5.3 or 25.5.4.

- E. Manufacturer of mechanical tension splice shall be present for first day's installation.

3.4 WELDING REINFORCING STEEL

- A. Welding reinforcing steel is permitted only where specifically shown on the drawings. All welding shall conform to AWS D1.4. Only weldable reinforcing steel conforming to ASTM A 706 or deformed bar anchors conforming to ASTM A 1064 shall be permitted. ASTM A 615 bars may not be welded for structural use.
- B. Tack welding of reinforcement shall not be permitted.
- C. Fusion welding of preassembled cages shall be permitted only under the following conditions:
 - 1. Written approval is received from the Building Official and the Engineer.
 - 2. Fusion welding of holding wires to ties, stirrups, and hoops in beams, columns and grade beams to preassemble reinforcing cages is permissible. The holding wire area shall not exceed five percent of the beam, column, or grade beam cross sectional longitudinal steel area. Fusion welding is not allowed to longitudinal reinforcing steel in any beam, column, or grade beam.
 - 3. Fusion welding of holding wires to the ends of the reinforcing steel placed in spread footings or mats is permitted if the fusion weld occurs within six bar diameters of the free end of the bar. Fusion welding is not allowed at the end of coupled, T-headed, or weld spliced bars.
 - 4. Fusion welding of holding wires shall not occur on a bent portion of a reinforcing bar. Bars shall not be bent where a fusion weld occurs.

3.5 SHRINKAGE AND TEMPERATURE REINFORCEMENT

- A. Provide shrinkage and temperature reinforcement as indicated on the drawings at right angles to main top and bottom bars for all structural slabs unless detailed otherwise on the drawings.

3.6 PLACEMENT OF WELDED WIRE REINFORCEMENT

- A. Wherever welded wire reinforcement is specified as reinforcement in pan-formed beams or slabs, it shall be continuous and properly lapped per ACI 318 Chapter 25.5.3 or 25.5.4 across the entire concrete surface and not interrupted by beam or girders.

3.7 REINFORCEMENT IN JOIST DISTRIBUTION RIBS

- A. Provide reinforcement in ribs, minimum one - #5 continuous top and bottom unless indicated otherwise on the drawings.

3.8 REINFORCEMENT IN COMPOSITE STEEL DECK SLAB

- A. Composite steel deck slabs shall be reinforced as indicated on the drawings.
- B. Extra Reinforcement over Girders: Provide additional reinforcing steel over interior girders as shown on the drawings.
- C. Placement of Slab Reinforcement: Provide bolsters, high chairs, and/or additional reinforcing as shown in details on the drawings to support the reinforcing with the clear cover shown on the drawings.

3.9 REINFORCEMENT AROUND OPENINGS IN COMPOSITE STEEL DECK SLABS

- A. For all openings in steel deck not framed with structural steel and greater than 10" in width in either direction, provide additional reinforcing steel as shown in details on the drawings.

3.10 REINFORCEMENT IN GRADE BEAMS

- A. Provide reinforcing in grade beams as shown on the drawings.
- B. Bar Support for Grade Beam Cages: Grade beam bottom steel shall be supported at 5'-0" maximum centers using beam bolsters that provide bottom cover to the reinforcing steel as noted on the drawings. Beam bolsters used shall be designed and manufactured for support on soil.

3.11 REINFORCEMENT IN TOPPING SLABS

- A. Provide reinforcing in topping slabs as shown on the drawings.

3.12 REINFORCEMENT IN HOUSEKEEPING PADS

- A. Provide reinforcing in housekeeping pads as shown on the drawings.

3.13 MECHANICAL AND PLUMBING REQUIREMENTS

- A. Refer to Mechanical and Plumbing Drawings for concrete requiring reinforcing steel. Such reinforcement shall be furnished as part of the work of this section.

3.14 FIELD QUALITY CONTROL

- A. Field Testing and Inspection: Refer to Specification 01 45 29 "Structural Testing and Inspections" for testing and inspection requirements associated with concrete reinforcing.

END OF SECTION 03 20 00

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes all labor, materials, services, equipment, and hardware required in conjunction with or related to the forming, delivery, and pouring of all cast-in-place concrete work. Concrete paving and walks are specified in Division 32. Architectural Concrete, Precast Concrete, Post-Tensioned Concrete and special requirements for Tilt-Up Concrete are specified in other Division 03 sections.
- B. Related Requirements:
 - 1. Specification 01 45 29 "Structural Testing and Inspections" for inspection requirements associated with cast-in-place concrete.
 - 2. Specification 01 81 13 "Sustainable Design Requirements" for sustainable design requirements.
 - 3. Specification 03 10 00 "Concrete Forming and Accessories" for forming associated with cast-in-place concrete.
 - 4. Specification 03 20 00 "Concrete Reinforcing" for reinforcement for cast-in-place concrete.

1.3 REFERENCES

- A. Reference Standards:
 - 1. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:
 - a. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 - b. ACI 301, "Specifications for Structural Concrete."
 - c. ACI 305.1, "Specification for Hot Weather Concreting."
 - d. ACI 318, "Building Code Requirements for Structural Concrete."
 - e. ACI 355.4, "Qualification of Post-Installed Adhesive Anchors in Concrete."
 - f. CRSI, "Manual of Standard Practice."

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Quality Control: The Contractor is responsible for quality control, including workmanship and materials furnished by subcontractors and suppliers.
2. Document Conflict and Precedence: In case of conflict among documents, including architectural and structural drawings and specifications, notify the Architect/Engineer prior to submitting proposal. In case of conflict between and/or among the structural drawings and specifications, the strictest interpretation shall govern, unless specified otherwise in writing by the Architect/Engineer.
3. Materials and installed work may require testing and retesting, as directed by the governing building code or the Architect/Engineer, at any time during progress of work.
 - a. The Contractor shall provide adequate notification to the Owner's Testing Agency of construction operations including the project schedule to allow the Testing Agency to schedule inspections. Failure to notify sufficiently may result in additional costs incurred by the Testing Laboratory that may be back-charged to the Contractor by the Owner.
 - b. The Contractor shall cooperate with laboratory personnel, provide access to the work, and provide access to manufacturer's operations.
 - c. The Contractor shall make adequate arrangement with the Owner's Testing Agency for inspection of material stockpiles and facilities.
 - d. The Contractor shall provide to the laboratory certificates and representative samples of materials proposed for use in the work in quantities sufficient for accurate testing as specified.
 - e. The Contractor shall furnish casual labor, equipment, and facilities as required for sampling and testing by the laboratory and otherwise facilitate the required inspections and tests.
 - f. Inspection or testing by the Owner does not relieve the Contractor of his responsibility to perform the Work in accordance with the Contract Documents. Tests not specifically indicated to be done at the Owner's expense, including retesting of rejected materials and installed work, shall be done at the Contractor's expense. See Structural Testing and Inspections section of the Specifications.
4. Responsibility for Selection and Use of Concrete Admixtures and Chemical Treatments: The Contractor shall be responsible for selecting admixtures and surface treatments that are compatible with the intended use of the concrete including all final surface treatments called for within this or other specifications or on the structural or architectural drawings. The Contractor is responsible for following the manufacturer's instructions for the use of their product including abiding by any limitations placed by the manufacturer on the use of any of its products.

B. Preinstallation Meetings:

1. Pre-Concrete Conference:
 - a. At least seven days prior to beginning concrete work, the Contractor shall conduct a meeting to review the proposed design mixtures and to

discuss required methods and procedures to produce concrete construction of the required quality. Also, review requirements for submittals, status of coordinating work and availability of materials. Establish work progress schedule and procedures for materials inspection, testing, and certifications. The contractor shall send a pre-concrete conference agenda to all attendees seven days prior to the scheduled date of the conference.

- b. The Contractor shall require responsible representatives of every party who is concerned with the concrete work to attend the conference, including but not limited to the following:

- 1) Contractor's Superintendent.
- 2) Laboratory responsible for the concrete design mix.
- 3) Laboratory responsible for field quality control.
- 4) Concrete Subcontractor.
- 5) Ready-Mix Concrete Producer.
- 6) Admixture Supplier.
- 7) Concrete Pumping Contractor.
- 8) Fiber Reinforcement Representative.
- 9) Owner's and Architect's/Engineer's Representative.

- c. Minutes of the meeting shall be recorded, typed and printed by the Contractor and distributed by him to all parties concerned within five days of the meeting. One copy of the minutes shall be transmitted to the following for information purposes:

- 1) Owner's Representative.
- 2) Architect.
- 3) Engineer-of-Record.

- d. The Engineer shall be present at the conference. The Contractor shall notify the Engineer at least seven days prior to the scheduled date of the conference.

C. Sequencing:

1. Provide for installation of inserts, hangers, metal ties, anchors, bolts, angle guards, dowels, thimbles, slots, nailing strips, blocking, grounds, and other fastening devices required for attachment of work. Properly locate in cooperation with other trades and secure in position before concrete is poured. Do not install sleeves in any concrete slabs, beams, or columns except where shown on the drawings or upon written approval of the Architect/Engineer.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including admixtures, patching compounds, epoxies, grouts, waterstops, joint systems, curing compounds, dry-shake finish materials, hardeners, sealers, joint fillers, and others as requested by Architect/Engineer.

B. Shop Drawings:

1. Construction Joints: Submit drawings of proposed construction joint locations in concrete for slab-on-grade, mat foundations, structural floors, roofs and walls. Submit any additional or changed reinforcing that is required at construction joints that differs from that shown on the drawings.
2. Openings, Sleeves, and Cores: Submit drawings of all openings to be formed, sleeved, cored, or sawcut in cast-in-place elements. Drawings shall indicate size and location of openings, sleeves, or cores.
3. Penetrations in Beams and Joists: Submit drawings locating all horizontal and vertical penetrations in beams and joists. Drawings shall indicate location, size, orientation, and type of penetrations.
4. Embedded Items: Submit drawings showing all items to be embedded in concrete elements, including plates, angles, bolts, and any non-structural items, such as conduit. Drawings shall indicate location, size, orientation, and type of embedded item.

C. Samples: Submit samples of materials specified if requested by Architect/Engineer, including names, sources, and descriptions.

D. Certificates:

1. Material and Mill Certificates:
 - a. Provide material and mill certificates as specified herein and in the Testing Laboratory section of the Specifications. The Manufacturer and Contractor shall sign the material and mill certificates certifying that each material item complies with specified requirements.
 - b. Provide certification from admixture manufacturers that chloride ion content complies with specified requirements.

E. Design Mixtures: Submit for each concrete mixture as specified herein.

F. Field Quality Control Submittals:

1. Surveys: Submit report certifying that all anchor rods and reinforcing dowels into columns above are in their proper location prior to placing of concrete.

G. Qualification Statements: Submit certifications for adhesive anchor installers.

H. Environmental Product Declarations:

1. To encourage the use of building products that are working to minimize their environmental and health impacts, consideration will be given to products with publicly available Environmental Product Declarations. For all concrete mixtures submit one of the following that applies to the product:
 - a. Product-specific Type III EPD with internal or external review that conform to ISO 14025, and EN 15804 or ISO 21930 and has at least a cradle to gate scope.
 - b. Industry Wide Type III EPD. A letter from the product manufacturer, on manufacturer's letterhead, stating that the manufacturer, and proposed

batch plants, participated in the NRMCA Industry-Wide Environmental Product Declaration.

- c. A letter from the product manufacturer, on manufacturer's letterhead, stating that the product does not have a product specific EPD nor was a participant in an industry wide EPD.
 2. Submit required EPDs at time of bid.
 3. Concrete mixes will be evaluated with consideration to their EPDs. Reference maximum cement content, where listed, per the "Classes of Concrete Matrix" in the structural drawings.
- I. Minutes of Preinstallation Meetings: Submit for review.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Concrete Supplier: The concrete supplier shall have a minimum of five years of experience in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment. The supplier must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
2. Concrete Contractor: The concrete contractor shall have a minimum of five years of experience with installation of concrete similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful service performance.
3. Adhesive Anchor Installers: The individuals performing the installation of adhesive anchors that are horizontally or upwardly inclined shall be certified in accordance with the ACI/CRSI Adhesive Anchor Installer Certification program.

- B. Survey for Anchor Rods and Reinforcing Steel Dowels: The Contractor shall use a qualified licensed professional engineer or licensed land surveyor to lay out the proper location of all embedded anchor rods and reinforcing steel dowels for columns above before they are encased in concrete. The surveyed locations of such elements shall be submitted to the Architect/Engineer for record, if requested.

C. Manufacturer Representative Presence:

1. Post-installed anchors: The manufacturer's representative for each post-installed anchor product (adhesive, expansion, undercut, screw, or insert anchor) shall be present during the first day's installation of the product to provide instruction for the correct installation of each type of any to be installed in accordance with the manufacturer's recommendation and the current ICC-ES Evaluation Report.
2. Fiber-reinforced concrete: The manufacturer's representative for each fiber type shall be present during the first pour in which the fiber is used to verify whether the dosage rate, placing, and finishing method is in accordance with the specifications and the manufacturer's instruction.

- D. Mockups: Provide mock-ups as required.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

- A. Refer to the drawings for classes and strengths of concrete required.
- B. Hydraulic Cement:
 - 1. Use ASTM C 150, ASTM C 1157, or ASTM C 595 (excluding Type IS) unless otherwise specified. Do not use Type III cement in slabs-on-grade unless approved in advance by the Engineer.
 - 2. Use one brand of cement, for each class of concrete, throughout the project, unless approved otherwise by the Architect/Engineer and the Owner's Testing Laboratory. Submit mill certificates certifying conformance to this specification for each brand and type of cement.
 - 3. Testing of cement in lieu of mill certificate submittal will be required if:
 - a. The cement has been in storage at the mixing site for over 30 days.
 - b. It is suspected by the Owner, Architect, Engineer, or Owner's Testing Laboratory that the cement has been damaged in storage or in transit or is in any way defective.
- C. Low-alkali cement: Cement that has the additional requirement that equivalent alkalis ($\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$) do not exceed 0.60% according to ASTM C 150-00, Table 2.
- D. Fly Ash: ASTM C 618, Class C or F.
- E. Silica Fume: ASTM C 1240, Amorphous Silica.
- F. Slag Cement: ASTM C 989, Grade 100 or 120 or ASTM C 595, Type IS or Type S.
- G. Normalweight Aggregates: ASTM C 33, and as herein specified. Submit material certificates from aggregate supplier or test results from an independent testing agency certifying conformance to this specification for each source of aggregate.
 - 1. For concrete identified on the drawings as exposed to Exposure Classes C1 and C2, submit certification that aggregate does not contain any deleterious materials that react with alkalis in the concrete mix to cause excessive expansion of the concrete for concrete that is exposed to wetting, has extended exposure to humid atmosphere, or is in contact with moist ground unless low-alkali cement is used.
- H. Lightweight Aggregates: ASTM C 330. Submit material certificates from aggregate supplier or test results from an independent testing agency certifying conformance to this specification for each source of aggregate.
- I. Water: Comply with the requirements of ASTM C 1602.
- J. Cementitious materials, aggregate, and water must be extracted or recovered as well as manufactured within 500 miles of the project site.

2.2 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
1. Subject to compliance with requirements, provide one of the following products and manufacturers:
 - a. GCP Applied Technologies; Darex or Daravair series.
 - b. Master Builder Solutions; MasterAir VR 10, MasterAir AE 90, MasterAir AE 200.
 - c. Sika Corporation; Sika AER.
 - d. The Euclid Chemical Company; Air Mix, AEA-92, Eucon Air 30 or Eucon Air 40.
 2. Submit manufacturer's certification that product conforms to the requirements specified and is compatible with all other admixtures to be used.
- B. Water-Reducing Admixture: ASTM C 494, Type A. See maximum permissible chloride ion content in concrete specified below.
1. Subject to compliance with requirements, provide one of the following products and manufacturers:
 - a. Master Builder Solutions; MasterPozzolith Series or MasterGlenium Series.
 - b. Sika Corporation; Plastocrete 161.
 - c. The Euclid Chemical Company; Eucon WR-75, Eucon WR-91, Eucon NW or Eucon LW.
 - d. GCP Applied Technologies; WRDA series, Zyla Series.
 2. Submit manufacturer's certification that product conforms to the requirements specified and is compatible with all other admixtures to be used.
- C. Mid-Range Water-Reducing Admixture: ASTM C 494, Type A and Type F. See maximum permissible chloride ion content in concrete specified below.
1. Subject to compliance with requirements, provide one of the following products and manufacturers:
 - a. Master Builders Solutions; MasterPolyheed Series or MasterGlenium Series.
 - b. The Euclid Chemical Company; Eucon MR, Eucon X-15 or Eucon X-20.
 - c. Sika Corporation; SikaPlast-300 GP.
 - d. GCP Applied Technologies; Daracem or Mira series.
 2. Submit manufacturer's certification that product conforms to the requirements specified and is compatible with all other admixtures to be used.
- D. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F or Type G. See maximum permissible chloride ion content in concrete specified below.

1. Subject to compliance with requirements, provide one of the following products and manufacturers:
 - a. GCP Applied Technologies; ADVA or Daracem Series.
 - b. Master Builders Solutions; MasterRheobuild 1000 or MasterGlenium Series.
 - c. Sika Corporation; Sikament.
 - d. The Euclid Chemical Company; Eucon 37/1037, Plastol series, Eucon SP or Eucon RD2.
 2. Submit manufacturer's certification that product conforms to the requirements specified and is compatible with all other admixtures to be used.
- E. Water-Reducing, Accelerator Admixture (Non-Corrosive, Non-Chloride): ASTM C 494, Type C or E. See maximum permissible chloride ion content in concrete specified below.
1. Subject to compliance with requirements, provide one of the following products and manufacturers:
 - a. GCP Applied Technologies; Polarset, Lubricon NCA, Daraset 400, or DCI.
 - b. Master Builders Solutions; MasterSet FP 20 or MasterSet AC 534.
 - c. The Euclid Chemical Company; Accelguard 80/90, Accelguard NCA, or Accelguard AcN.
 - d. Sika Corporation; Plastocrete 161FL.
 2. Submit manufacturer's certification that product conforms to the requirements specified and is compatible with all other admixtures to be used.
- F. Water-Reducing, Retarding Admixture: ASTM C 494, Type D. See maximum permissible chloride ion content in concrete specified below.
1. Subject to compliance with requirements, provide one of the following products and manufacturers:
 - a. GCP Applied Technologies; Daratard series, or Zyla R.
 - b. Master Builders Solutions; MasterPozzoloth R series, or MasterSet DELVO series.
 - c. Sika Corporation; Plastiment.
 - d. The Euclid Chemical Company; Eucon Retarder series.
 2. Submit manufacturer's certification that product conforms to the requirements specified and is compatible with all other admixtures to be used.
- G. Shrinkage Reducing Admixture.
1. Subject to compliance with requirements, provide one of the following products and manufacturers:
 - a. For Air-Entrained Concrete:
 - 1) GCP Applied Technologies; Eclipse 4500.
 - 2) The Euclid Chemical Company; Eucon SRA.

- 3) Master Builders Solutions; MasterLife CRA 007.
- b. For Non Air-Entrained Concrete
 - 1) GCP Applied Technologies; Eclipse Floor 200.
 - 2) Master Builders Solutions; MasterLife SRA 20
- H. Corrosion Inhibitor: 30% calcium nitrite:
 1. Products: Subject to compliance with requirements, provide the following at dosage rates per Engineer from manufacturer's recommendation based on design life, application, clear cover and other products in concrete mix:
 - a. The Euclid Chemical Company; Eucon CIA or Eucon BcN.
 - b. GCP Applied Technologies; DCI or DCI-S.
 - c. BASF Corporation; MasterLife CI 30.
 - d. Sika Corporation; Sika CNI.
- I. Corrosion Inhibitor: Amine-Ester type:
 1. Products: Subject to compliance with requirements, provide the following at dosage rates per manufacturer's recommendation:
 - a. BASF Corporation; MasterLife CI 222.
- J. Crystalline-Forming Waterproofing Admixture: A powder admixture capable of producing concrete that is water tight under hydrostatic pressure up to seven atmospheres when tested in accordance with Corps of Engineers test CRD-C48 and capable of sealing cracks up to 0.4 mm.
 1. Products: Subject to compliance with requirements, provide the following at dosage rates per manufacturer's recommendation:
 - a. ICS/Penetron International/Ltd; Penetron Admix.
 - b. Kryton International, Inc.; Krystol Internal Membrane (ESR-1515).
 - c. Xypex Chemical Corporation; Xypex Admix C1000 or C500.
 - d. Sika Corporation; Sika WT-215P
 - e. Master Builders Solutions; MasterLife 300C
 - f. The Euclid Chemical Company; Eucon Vandex AM-10
- K. Moisture Vapor Reduction Admixture: Acceptable products include:
 1. Barrier One, Inc.; Barrier-1.
 2. USC Technologies, Inc.; Aridus.
 3. GCP Applied Technologies; Eclipse Floor 200.
 4. Concure Systems; Concure Systems Admixture.
 5. Specialty Products Group; Vapor Lock VL 20/20.
 6. ISE Logik Industries; MVRA 900.
- L. Calcium Chloride: Calcium chloride is not permitted.
- M. Certification: Written conformance to all the above-mentioned requirements and the chloride ion content of the admixture as tested by an accredited laboratory will

be required from the admixture manufacturer at the time of design mixture review by the Engineer.

2.3 WATERSTOPS

- A. Provide waterstops at all construction joints and other joints in all foundation walls below grade and where shown on the drawings. Size to suit joints and factory fabricate corners, intersections, and directional changes. The selected waterstop products shall be appropriate for the specific joint condition as specified by the manufacturer, including number of layers of reinforcement, minimum concrete thickness and minimum concrete cover.

1. Products:

a. Swell Hydrophilic Waterstops:

- 1) Manufacturers: GCP Applied Technologies; ADCOR ES or ADCOR 500S.

b. Polyvinyl Chloride (PVC) Waterstops: Comply with Corps of Engineers CRD-C 572. Provide flat, dumbbell type or centerbulb type as noted on the drawings.

c. Rubber Waterstops: Comply with Corps of Engineers CRD-C 513. Provide flat, dumbbell type or centerbulb type as noted on the drawings.

d. Preformed Plastic Waterstops: Comply with Federal Specifications SS-S-210A "Sealing Compound for Expansion Joints".

- 1) Manufacturers: Henry Corporation; Synko-Flex Waterstop

e. Bentonite Waterstops:

- 1) Manufacturers: CETCO; Bentonite Waterstop-RX.

2.4 VAPOR RETARDERS

- A. Provide vapor retarder cover chosen from products specified below over prepared base material where indicated. Vapor retarders shall be a complete system, including all materials and accessories as recommended by the manufacturer for specific installation and assembly.

1. Plastic Vapor Retarder under slabs-on-grade: Provide a flexible, preformed sheet membrane conforming to ASTM E 1745 with the following properties:

a. Class A material.

b. Minimum of 15 mils thick.

c. Maximum water vapor permeance rating of 0.01 perms after mandatory conditioning as tested by ASTM E 96 or ASTM F 1249.

d. Manufacturer's recommended penetration boots, joint tape and mastic.

e. Acceptable products include the following:

- 1) Stego Industries, LLC; Stego Wrap Vapor Barrier (15 mil).

- 2) Epro Waterproofing Systems; Ecoshield-E (15 mil).
 - 3) Insulation Solutions; Viper Vapor Check II (15 mil).
 - 4) Raven Industries; VAPORBLOCK VBLP15 (15 mil).
 - 5) W.R. Meadows, Inc; Perminator (15 mil)
 - 6) Tex-Trude, LP, Xtreme (15 mil)
2. Bituminous Vapor Retarders: Provide a pre-molded membrane consisting of reinforced core and carrier sheet with fortified bitumen layers, protective weather coating, and plastic anti-stick sheet conforming to ASTM E 1993 with the following properties:
- a. Maximum water vapor permeance rating of 0.002 perms after mandatory conditioning as tested by ASTM E 1745.
 - b. Manufacturer's recommended tape and mastic.
 - c. Acceptable products include the following:
 - 1) W.R. Meadows, Inc; Premoulded Membrane Vapor Seal with Plasmatic Core (PMPC).

2.5 FLOOR AND SLAB TREATMENTS

- A. Non-Oxidizing Metallic Floor Hardener: Packaged dry, combination of materials consisting of portland cement, non-rusting aggregate and plasticizing admixtures.
1. The Euclid Chemical Company; Diamond-Plate.
 2. Master Builders Solutions; MasterTop 210COR.

2.6 CURING MATERIALS

- A. Liquid Membrane-Forming Curing and Curing and Sealing Compounds:
1. Water-Based Dissipating Resin Type Curing Compound: Curing Compound shall be a dissipating resin type, which chemically breaks down after approximately four weeks. Membrane forming compound shall meet ASTM C 309, Types 1 or 1D, Class B with a VOC content less than 350 grams per liter.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) The Euclid Chemical Company; Kurez DR VOX.
 - 2) L&M Construction Chemicals; L&M Cure R.
 - 3) Dayton-Superior Company; Clear Resin Cure J11W.
 - 4) W.R. Meadows, Inc; 1100-Clear.
 - 5) US Mix Co.; US Spec Maxcure Resin Clear.
 - 6) SpecChem LLC; SpecRez.
 - b. Submit manufacturer's certification that product conforms to the requirements specified and is compatible with any covering or surface treatments to be applied. Submit any instructions that must be followed prior to any subsequent surface treatments and floor coverings.

2. High Solids, Water-Based, Non-Yellowing Curing and Sealing Compound: Water based membrane-forming curing and sealing compound, acrylic type, complying with ASTM C 1315, Type 1, Class A classified as low odor with a VOC content less than 350 grams per liter. Do not apply to surfaces that are to receive subsequent cementitious toppings, sealers, hardeners, ceramic tile resilient flooring, vinyl-backed carpet, wood, terrazzo, epoxy overlays or adhesives, or other coating or finishing products.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) The Euclid Chemical Company; Super Diamond Clear VOX.
 - 2) L&M Construction Chemicals; Lumiseal WB Plus.
 - 3) Master Builders Solutions; MasterKure CC 1315.
 - 4) Dayton-Superior Corporation; Cure & Seal 1315EF
 - 5) W.R. Meadows, Inc; Vocomp 30.
 - 6) SpecChem LLC; Cure & Seal WB 30.
 - b. Submit manufacturer's certification that product conforms to the requirements specified and is compatible with any covering or surface treatments to be applied. Submit any instructions that must be followed prior to any subsequent surface treatments.
- B. Evaporation Control: Monomolecular film forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss in hot, dry, or windy weather conditions.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. The Euclid Chemical Company; Eucobar.
 - b. L&M Construction Chemicals; E-Con.
 - c. Master Builders SolutionsBASF Corporation; MasterKure ER 50.
 - d. Dayton-Superior Corporation; Aqua Film (J74).
 - e. Sika Corporation; SikaFilm.
 - f. W.R. Meadows, Inc; Sealtight Evapre.
 - g. US Mix Co.; US Spec Monofilm ER.
 - h. SpecChem LLC; SpecFilm RTU.
 2. Submit manufacturer's certification that product conforms to the requirements specified and is compatible with all coverings and surface treatments to be applied. Submit any instructions that must be followed prior to any subsequent surface treatments.
- C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately nine ounces per square yard, complying with AASHTO M 182, Class 2.
- D. Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C 171:
 1. Waterproof paper.
 2. Polyethylene film.
 3. Polyethylene-coated burlap.

4. Polyethylene-coated natural cellulose fabric such as Greenstreak Group, Inc.; Aquacure.
5. Cover for Industrial Slab: Provide a low permeance moisture-retaining cover that allows a moisture loss of no more than one pound per square yard in 72 hours when tested in accordance with ATSM C 156 for industrial slabs. The material shall be non-staining and meet with requirements of ASTM C 171.

2.7 RELATED MATERIALS

A. Post-Installed Anchors:

1. Qualified Products:

- a. Mechanical Anchors: Only anchors having passed Acceptance Criteria 193 for use in cracked concrete and resisting wind and seismic loads shall be approved for use. Reports from the following organizations are acceptable:
 - 1) ICC Evaluation Service Report.
 - 2) IAPMO Uniform Evaluation Services.
- b. Adhesive Anchoring Systems: Only adhesive anchor systems that comply with the latest revision of ICC-ES Acceptance Criteria 308 for use in cracked concrete and resisting wind and seismic loads shall be approved for use. Reports from the following organizations are acceptable:
 - 1) ICC Evaluation Service Report.
 - 2) IAPMO Uniform Evaluation Services.

2. Alternate Anchor Approval: Install only anchors identified on the drawings by manufacturer and product. Substitutions using products approved by this Specification may be permitted provided complete design calculations are signed and sealed by a registered professional engineer licensed in the state where the project is located and furnished to the Engineer for review and approval prior to commencement of work. The Contractor shall request design criteria for all conditions where a product substitution is considered. Failure to obtain approval for an anchor substitution may result in the request by the Engineer to remove installed anchors and replace with the product specified on the drawings at the Contractor's expense.
3. Installation: All installation of post-installed anchors shall be in accordance with the Manufacturer's Printed Installation Instructions (MPII).
4. Interior Use: All anchors for use in interior conditioned environments free of potential moisture shall be manufactured from carbon steel zinc plated in accordance with Federal Specification QQ-Z-325C, Type II, Class 3.
5. Exterior or Exposed Use: All anchors for use in exposed or potentially wet environments or for attachment of exterior cladding materials shall be galvanized or stainless steel. Galvanized anchors shall conform to ASTM A 153. Stainless steel anchors shall be manufactured from 300 series stainless steel.
6. Nuts and Washers: Nuts and washers shall be furnished from the manufacturer and used with the anchors.

7. Anchor Types:

a. Expansion and Undercut Anchors in Concrete:

- 1) Type: All expansion and undercut anchors in concrete shall be wedge type expansion, sleeve type expansion, or undercut type anchors.
- 2) Acceptable Products and Manufacturers – Normalweight and Sand-Lightweight Concrete Not on Corrugated Steel Deck:
 - a) Hilti, Inc.; Kwik Bolt TZ (ESR-1917).
 - b) Hilti, Inc.; HDA Undercut Anchor (ESR-1546).
 - c) Hilti, Inc.; HSL-3 Heavy Duty Sleeve Anchor (ESR-1545).
 - d) Simpson Strong-Tie Co., Inc.; Strong-Bolt Wedge Anchor (ESR-1771).
 - e) Simpson Strong-Tie Co., Inc.; Strong-Bolt 2 Wedge Anchor (ESR-3037).
 - f) USP Structural Connectors; DUC Undercut Anchor (ESR-1970).
 - g) Dewalt; Power Stud+ SD1 Expansion Anchor (ESR-2818).
 - h) Dewalt; Power Stud+ SD2 Anchor (ESR-2502).
 - i) Dewalt; Atomic+ Undercut Anchor (ESR-3067).
 - j) Dewalt; Power-Bolt+ Sleeve Anchor (ESR-3260)
 - k) MKT Metall-Kunststoff-Technik/UCan Fastening Products; SRS TZ Anchor (ESR-2461).
- 3) Acceptable Products and Manufacturers – Normalweight and Sand-Lightweight Concrete on Corrugated Steel Deck:
 - a) Hilti, Inc.; Kwik Bolt TZ (ESR-1917).
 - b) Simpson Strong-Tie Co., Inc.; Strong-Bolt Wedge-Anchor (ESR-1771).
 - c) Dewalt; Power Stud+ SD1 Expansion Anchor (ESR-2818).
 - d) Dewalt; Power Stud+ SD2 Anchor (ESR-2502).

b. Screw and Insert Anchors in Concrete:

- 1) Acceptable Products and Manufacturers:
 - a) Hilti, Inc.; KWIK HUS-EZ Anchor (ESR-3027).
 - b) Simpson Strong-Tie Co., Inc.; Titen HD (ESR-2713).
 - c) Dewalt; Snake+ Anchor (ESR-2272).
 - d) Dewalt; Screw-Bolt+ (ESR-3889).

c. Adhesive Anchoring Systems in Concrete:

- 1) Chemical anchoring of anchors, rods, or reinforcing steel is not allowed for fire-rated assemblies, unless specified provided for in the drawings.
- 2) Consult with the manufacturer for the minimum temperature of the concrete substrate allowed.
- 3) Only personnel trained to install adhesive anchors and certified in accordance with the ACI/CRSI Adhesive Anchor Installer

Certification Program shall install adhesive anchors, including reinforcing steel.

- 4) All anchors installed horizontally or upwardly inclined require continuous inspection.
- 5) All adhesive anchors shall be installed in concrete having a minimum age of 21 days at the time of anchor installation.
- 6) Acceptable Products and Manufacturers:
 - a) Hilti, Inc.; HIT-HY 200 (ESR-3187).
 - b) Hilti, Inc.; HIT-RE 500 V3 (ESR-3814)
 - c) ITW Red Head; EPCON G5 (ESR-1137).
 - d) ITW Red Head; EPCON S7 (ESR-2308).
 - e) Dewalt; PE 1000+ (ESR-2583).
 - f) Dewalt; Pure110+ (ESR-3298).
 - g) Dewalt; AC200+ (ESR-4027).
 - h) Simpson Strong-Tie; SET-XP Adhesive (ESR-2508).
 - i) Simpson Strong-Tie; SET-3G Adhesive (ESR-4057).
 - j) Simpson Strong-Tie; AT-XP (IAPMO ER-263).
- 7) These products may not be used in concrete cast over corrugated deck.
- 8) Threaded Rods Chemically Anchored in Concrete:
 - a) Type: Threaded rods installed in holes using a chemical anchoring process shall have a 45° chiseled end on the embedded end.
 - b) Interior Application: Meet the requirements of ASTM A 307, A 36 or A 193, grade B7.
 - c) Exterior Application: Meet the requirements of ASTM A 153 galvanized steel, or F 593, Group 1 or 2, condition CW stainless steel.
- 9) Steel Reinforcing Bars:
 - a) Reinforcing steel installed shall comply with ASTM A 615 or ASTM A706 unless noted otherwise in the structural drawings. The embedded portions of reinforcing bars must be straight, and free of mill scale, rust, mud, oil and other coatings that may impair the bond with the adhesive.
 - b) Reinforcing bars must not be bent after installation except as permitted in the structural drawings. Heating of reinforcing bars to facilitate field bending is not permitted.

B. Bonding Compound: Polyvinyl acetate or acrylic base, for use in cosmetic and/or nonstructural repairs.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Acrylic or Styrene Butadiene:
 - 1) Dayton-Superior Corporation; Acrylic Bonding Agent J40.
 - 2) The Euclid Chemical Company; SBR Latex, Akkro-7T.

- 3) GCP Applied Technologies; Daraweld C.
 - 4) BASF Corporation; MasterEmaco A 400
 - 5) Sika Corporation; SikaLatex.
 - 6) W.R. Meadows, Inc; Acry-Lok.
 - 7) US Mix Co.; US Spec Acrylcoat.
 - 8) SpecChem, LLC; Strong Bond Acrylic Bonder.
- b. Polyvinyl Acetate (Interior Use Only):
- 1) The Euclid Chemical Company; Tammsweld.
 - 2) L&M Construction Chemicals; Primer One.
 - 3) Dayton-Superior Corporation; PVA Bonding Agent J41.
 - 4) SpecChem, LLC; SpecWeld.
 - 5) W.R. Meadows, Inc; Intralok.
- C. Epoxy Products: Two-component material suitable for use on dry or damp surface, complying with ASTM C 881.
1. Products for Crack Repair:
 - a. Sika Corporation; Sikadur 35 Hi Mod LV – injection type.
 - b. Sika Corporation; Sikadur 52 – injection type.
 - c. Sika Corporation; Sikadur 55 SLV – gravity feed.
 - d. The Euclid Chemical Company; Dural Injection Gel.
 - e. Dayton-Superior Corporation, Inc; Sure-Inject (J56 or J56SLV).
 - f. BASF Corporation; MasterInject 1000.
 - g. Simpson Strong-Tie Co., Inc.; ETI-LV or ETI-GV – injection type.
 - h. Unitex; Pro-Poxy 100 or Pro-Poxy 50.
 - i. Adhesives Technology; Crackbond LR 321 or Crackbond LR 321 LPL.
 - j. W.R. Meadows, Inc; Rezi-Weld LV.
 - k. SpecChem LLC; SpecPoxy 1000.
 2. Products for Epoxy Mortar Patches:
 - a. Sika Corporation; Sikadur Lo-Mod LV.
 - b. Dayton-Superior Corporation; Sure Patch.
 - c. BASF Corporation; MasterInject 1500.
 - d. Unitex; Pro-Poxy 2500.
 - e. W.R. Meadows, Inc; Rezi-Weld 1000.
 - f. SpecChem, LLC; SpecPoxy Binder.
 3. Products for Epoxying Steel Plates to Concrete: Conform to ASTM C 881-13, Type IV, Grade 3, Class A, B, & C except gel times.
 - a. Sika Corporation; Sikadur 31 Hi-Mod Gel.
 - b. Dayton-Superior Corporation, Inc; Sure Anchor J50 or Sure Bond J58
 - c. BASF Corporation; MasterEmaco ADH 1420.
 - d. Unitex; Pro-Poxy 300.
 - e. The Euclid Chemical Company; Duralcrete Gel.
 - f. SpecChem, LLC; SpecPoxy 3000.

- D. Reglets: Where resilient or elastomeric sheet flashing or bituminous membrane is terminated in reglets, provide reglets of not less than 26 gauge galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.
- E. Contraction and Construction Joint-Filler Material for Slabs-on-Grade: Provide a two-component semi-rigid, 100% solids epoxy having a minimum Shore A Hardness of 80 when tested in accordance with ASTM D 2240. Subject to compliance with requirements, provide one of the following:
1. The Euclid Chemical Company; Euco 700.
 2. Dayton-Superior Corporation, Inc.; Sure Fil J52
 3. BASF Corporation; MasterSeal CR 190.
 4. Metzger/McGuire Co.; MM-80.
 5. W.R. Meadows, Inc; Rezi-Weld Flex.
 6. SpecChem, LLC; SpecPoxy CJ.
- F. Bondbreaker for Construction Joints in Slabs-on-Grade: A dissipating bondbreaking compound containing no silicones, resins, or waxes, and that conforms to ASTM C 309. Subject to compliance with requirements, acceptable manufacturers include the following:
1. Dayton-Superior Corporation, Inc.; Sure-Lift J6WB.
 2. SpecChem, LLC; SpecTilt 100.
- G. Joint-Filler Strips for Isolation Joints in Slabs-on-Grade: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
- H. Rigid-Cellular-Polystyrene Boards use as Fill under Topping Slabs or Slabs-on-Grade: Provide rigid, expanded (EPS) or extruded (XPS) cellular polystyrene boards that conform to ASTM D 6817 or ASTM C 578 with a minimum density of 15 kilograms per cubic meter; a flame spread index of not more than 75 and a smoke-develop index of not more than 450 where tested for use in accordance with ASTM E 84 or UL 723. Subject to compliance with requirements, acceptable manufacturers include the following:
1. Dow Chemical Company; STYROFOAM Brand.
 2. Therma Foam; Foam-Control EPS Geofoam.
 3. Carpenter Co.; EPS Envirogreen Geofoam.
 4. Insulfoam; Insulfoam GF (EPS Geofoam).

2.8 REPAIR MATERIALS

- A. Self-Leveling Mortars, Underlayment Compound: Freeflowing, self-leveling, pumpable cementitious base compound. Follow manufacturer's instruction regarding the use of a bonding agent.
1. Products: Unless specified otherwise, provide one of the following:
 - a. BASF Corporation; MasterTop 110 SL.
 - b. The Euclid Chemical Company; Flo-Top, Super Flo-Top.
 - c. Dayton-Superior Corporation, Inc; Levelayer.
 - d. US Mix Co.; US Spec Self-Leveling Underlayment.

- e. The Euclid Chemical Company; Level Magic Lightweight.
 - f. SpecChem, LLC; SpecFlow.
- B. Polymer Patching Mortar: Polymer and microsilica modified cementitious-based compounds.
- 1. Products:
 - a. Horizontal Application:
 - 1) The Euclid Chemical Company; Thin Top Supreme, Concrete Top Supreme.
 - 2) Sika Corporation; Sikatop 121 Plus or Sikatop 122 Plus.
 - 3) BASF Corporation; MasterEmaco T 310CI.
 - 4) BASF Corporation; MasterEmaco N424 or N423 RS.
 - 5) US Mix Co.; US Spec H2 or NuTop.
 - 6) The Euclid Chemical Company; Speed Crete PM.
 - 7) SpecChem, LLC; RepCon H.
 - 8) Dayton-Superior Corporation; Thin Resurfacer or Special Patch.
 - b. Upwardly Inclined Application:
 - 1) The Euclid Chemical Company; Verticoat or Verticoat Supreme.
 - 2) Sika Corporation; Sikatop 123 Plus.
 - 3) BASF Corporation; MasterEmaco N 350CI.
 - 4) BASF Corporation; MasterEmaco N423 RS.
 - 5) US Mix Co.; US Spec V/O Patch CI.
 - 6) The Euclid Chemical Company; Speed Crete PM.
 - 7) SpecChem, LLC; RepCon V/O.
 - 8) Dayton-Superior Corporation; Civil/Structural VO.
- C. High Strength Flowing Repair Mortar: For forming and pouring structural members, or large horizontal repairs, provide flowable one-part, high strength microsilica polymer modified repair mortar with 3/8" aggregate. The product shall achieve 9,000 PSI at 28-days at a nine inch slump.
- 1. Products:
 - a. BASF Corporation; MasterEmaco T 1060.
 - b. US Mix Co.; US Spec STR Mortar.
 - c. The Euclid Chemical Company; Eucocrete.
 - d. The Euclid Chemical Company; Tamms Form and Pour.
 - e. SpecChem, LLC; RepCon 928.
 - f. Dayton-Superior Corporation; Civil/Structural FPX.
- D. Anti-Corrosive Epoxy/Cementitious Adhesive: Water-based epoxy/cementitious compound for adhesion and corrosion protection of reinforcing members (20 hour maximum open time).
- 1. Products:
 - a. The Euclid Chemical Company; Duralprep A.C.
 - b. Sika Corporation; Sika Armatec 110 Epocem.

- c. BASF Corporation: MasterEmaco P 124.
- d. Dayton-Superior Corporation; Perma Prime 3C.

2.9 PROPORTIONING AND DESIGN OF CONCRETE MIXTURES

- A. The Contractor shall submit design concrete mixtures for each class of concrete indicated on the structural drawings and in the Specifications for approval by the Engineer and Owner's Testing Laboratory at least 15 working days prior to the start of construction. If required, the Contractor shall engage the services of an independent Testing Laboratory to assist in preparing the design mixtures. The Contractor shall not begin work with a particular mixture until that design mixture has been approved.
- B. The Contractor, acting in conjunction with his Concrete Supplier and his Testing Laboratory, shall submit in writing, with his design mixtures, the method used to select mixture proportions. Either of the following methods, as outlined in ACI 301, may be used:
 - 1. Field Experience Method.
 - 2. Laboratory Trial Mixture Method.
- C. Required types of concrete and compressive strengths shall be as indicated on the Structural Drawings.
- D. All design mixtures shall state the following information:
 - 1. Design mixture number or code designation by which the Contractor shall order the concrete from the Supplier.
 - 2. Identify design mixture usage (i.e., columns, shear walls, footings, slab-on-grade, etc.).
 - 3. Wet and dry unit weights.
 - 4. Compressive strength and associated age (28-day, 56-day, etc.).
 - 5. Aggregate type, source, size, gradation, fineness modulus.
 - 6. Cement type and brand.
 - 7. Fly ash or other pozzolan type and brand (if any).
 - 8. Admixtures including air entrainment, water reducers, high-range water reducers, accelerators, and retarders.
 - 9. Design slump or slump/flow.
 - 10. Proportions of each material used.
 - 11. Water/cementitious ratio and maximum allowable water content.
 - 12. Method by which the concrete is intended to be placed (bucket, chute, or pump).
 - 13. Required average strength qualification calculations per ACI 301 4.2.3.3a and 4.2.3.3b. Submit separate qualification calculations for each production facility that will supply concrete to the project.
 - 14. Documentation of Average Strength (Trial Mixture Data or Field Test Data) per ACI 301: When field test data is used to qualify average strength, submit separate documentation for each production facility that will supply concrete to the project.
 - 15. Field test data submitted for qualification of average strength under ACI 301 shall include copies of the Concrete Testing Agency's reports from which the data was compiled.

- E. Low Alkali Concrete: For concrete identified on the drawings as Exposure Classes C1 and C2, the total alkali contribution from cementitious materials in the concrete mix shall not exceed 4.0 pounds per cubic yard of concrete unless the aggregate used is certified to contain no deleterious materials that react with alkalis in the concrete mix as defined in ASTM C 33. This requirement may be met by the use of low-alkali cement.
- F. Supplementary Cementitious Materials: Fly ash and/or ground granulated blast-furnace slag replacement of Portland cement shall be within percentage replacement levels listed on the drawings unless noted otherwise. Every effort should be made to reduce the amount of cement to the minimum practical amount, and still achieve performance requirements contained in the Contract Documents.
1. Cement replacement shall not exceed a percentage level that has been shown by experience on other projects to exhibit satisfactory performance using materials from identical sources as proposed for this project. As an alternate, trial concrete batches can be performed to identify design mixtures that maximize cement replacement while meeting strength requirements per ACI 301 and finishability criteria.
 2. The use of fly ash or slag in architecturally exposed structural concrete shall be coordinated with the Architect, Engineer, and Contractor.
 3. Overall replacement percentages with combined fly ash and slag shall not exceed the maximum identified with slag or be less than the minimum identified with fly ash for each type of element. In addition, the replacement percentage of fly ash within the combined mixture shall not exceed the maximum identified with fly ash alone.
 4. Replacement percentages exceeding the maximum may be permitted at the discretion of the Architect, Engineer of Record, and Contractor.
 5. For concrete identified on the drawings as being subject to Exposure Class F3, the maximum amount of supplementary cementitious materials shall not exceed the limits noted in Table 4.2.2.7.b.2 "Maximum cementitious materials requirements for concrete exposed to deicing chemicals" of ACI 301.
 6. Except for Mass Concrete, the Contractor may submit for approval a revised design mixture with lower supplementary cementitious material percentages than herein specified should finishability or other issues arise due to changing weather conditions.
- G. Aggregate: Comply with the following special requirements:
1. For exposed concrete, provide aggregates from a single source.
 2. For exposed surfaces subject to Exposure Class C1 or C2, do not use aggregates containing spalling-causing deleterious substances.
 3. For slabs and other designated concrete, combined aggregate gradation shall be 8% - 18% for large top size aggregates (1 1/2 inches) or 8% - 22% for smaller top size aggregates (1 inch or 3/4 inch) retained on each sieve below the top size and above the No. 100. Deviations from this gradation may be allowed upon the approval of the Engineer subject to the following limitations:
 - a. The percent retained on two adjacent sieves shall be not less than 5%.
 - b. The percent retained on three adjacent sieves shall be not less than 8%.
 - c. If the percent retained on two adjacent sieves is less than 8%, the total percent retained on either of those sieves and the adjacent outside sieve shall be not less than 13%.

H. Admixtures:

1. Admixtures to be used in concrete shall be subject to the approval of the Engineer and Owner's Testing Laboratory and shall be used for the purpose intended by the manufacturer to produce concrete to meet the specified requirements.
2. Quantities of admixtures to be used shall be in strict accordance with the manufacturer's instructions.
3. Air Content Requirements: For concrete subject to Exposure Class F1, F2 or F3 as noted on the drawings, use air-entrainment admixtures to provide concrete such that the air content at the point of placement shall conform to the requirements of ACI 301 Table 4.2.2.7.b "For Exposure Category F: Freezing and thawing exposures" within plus or minus 1.5%. Required air content levels may be reduced by 1.0 percent for concrete strengths above 5,000 PSI.
 - a. Interior steel troweled surfaces shall not have more than 3% total air content.
 - b. Surfaces scheduled to receive hardeners shall not have more than 3% total air content.
 - c. Air-entraining admixtures are not permitted in industrial slabs.

I. Lightweight Structural Concrete:

1. Comply with the requirements of ACI 301, Section 7.
2. Provide concrete with a dry unit weight of not more than 116 pounds per cubic foot and not less than 110 pounds per cubic foot. Design mixture to produce strengths as indicated on the drawings with a split cylinder strength factor ($f_{ct}/(f'c)^{0.5}$) of not less than 5.7.

J. Adjustments of Concrete Mixtures: Design mixture adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Such adjustments shall be provided at no additional cost to the Owner. Any adjustments in approved design mixtures including changes in admixtures shall be submitted in writing to the Engineer and Owner's Testing Laboratory for approval prior to field use.

K. Shrinkage: Concrete so identified on the drawings shall be proportioned for a maximum allowable unit shrinkage as noted on the drawings, measured at 28 days after curing in lime water as determined by ASTM C 157 (using air storage). Submit results of test for each class of applicable concrete after every 500 cubic yards placed.

L. Chloride Ion Content:

1. Unless noted otherwise, the maximum water soluble chloride ion concentration in hardened concrete measured at ages from 28 to 42 days contributed from all ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed the limits specified in ACI 318-14 Table 19.3.2.1 "Requirements for concrete by exposure class" depending on to which Corrosion Exposure Class (C0, C1 or C2) the concrete is subject as noted on the drawings. Water-soluble chloride ion tests shall conform to ASTM C 1218. One test shall be run for each class of concrete before the

- design mixture submittal and each time a change is made to the design mixture (such as change in aggregate type or source).
2. The chloride ion content in all concrete used for prestressed or post-tensioned concrete shall not exceed 0.06 percent by weight of cement.
 3. The Concrete Supplier shall certify that the chloride ion content in all concrete design mixtures used on the project does not exceed the limits stated above.

2.10 CONCRETE MIXING

- A. Ready-Mix Concrete: Comply with requirements of ANSI/ASTM C 94 and the Structural Testing and Inspections section of the specifications.

2.11 SOURCE QUALITY CONTROL

- A. Source Inspection: Refer to Specification 014529 "Structural Testing and Inspections" for inspection requirements associated with cast-in-place concrete.

PART 3 - EXECUTION

3.1 SLUMP LIMIT

- A. The slump, as measured in the field where concrete cylinders are taken, shall be within plus or minus 1-1/2 inches of the design slump noted in the approved Design Mixture submittal. Self-Consolidating Concrete shall have a slump/flow of plus or minus two inches of the design slump/flow noted on the approved Design Mixture submittal. Water may be added to the concrete in the field only to the extent that the prescribed water/cementitious ratio noted in the approved Design Mixture submittal is not exceeded. The responsibility for adding water to trucks at the job site shall rest only with the Contractor's designated representative. The Contractor is responsible that all concrete placed in the field is in conformance with the Contract Documents.

3.2 VAPOR RETARDER INSTALLATION

- A. Install and repair damaged vapor retarder in accordance with ASTM E 1643 and manufacturer's instructions.
- B. Lap all seams per manufacturer's instruction (6" minimum lap) and seal all joints in the field with the specified pressure sensitive tape. Heat-welded joints done in a shop prior to delivery is an acceptable method to minimize the number of field joints.
- C. Seal all pipe penetrations through the vapor retarder with a boot made from the vapor retarder material and tape or mastic.

3.3 JOINTS IN CONCRETE

- A. Construction Joints: Locate and install construction joints as indicated on the drawings or if not shown on drawings, located so as not to impair strength and appearance of the structure, as acceptable to Architect/Engineer.
1. Keyways: Provide keyways with a depth of one tenth of the member thickness (1 1/2" minimum or as shown on the drawings) in construction joints only where shown on the drawings.
 2. Joint Construction: Place construction joints in the center one third of suspended spans and grade beams and as shown on the drawings for slabs-on-grade and walls unless shown otherwise. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise shown on the drawings. Dowels that cross construction joints shall be supported during concreting operations so as to remain parallel with the slab or wall surface and at right angles to the joint. Submit all construction joint locations as a shop drawing submittal.
 3. Waterstops: Provide waterstops in construction joints as indicated on the Architectural and Structural Drawings. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions. Waterstops shall be installed with a minimum of 3" of concrete cover.
 4. Isolation Joints in Slabs-on-Grade: Construct isolation joints (without dowels) in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces only where specifically detailed on the drawings. Install joint-filler strips at joints where indicated. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated on the drawings. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together. Provide construction joints with dowels at all locations unless isolation joints are detailed.
- B. Contraction Joints in Slabs-on-Grade and Unbonded Topping Slabs: Install contraction joints at locations and spacings as indicated on the drawings or if not shown on drawings, located so as not to impair strength and appearance of the structure, as acceptable to Architect/Engineer. Maximum joint spacing shall be per the drawings and be perpendicular to the slab surface. Use one of the two following methods (sawed or formed) to create the joints. Do not use the formed joint in areas subject to vehicular traffic or in industrial slabs.
1. Sawed Joints:
 - a. Primary Method: Early-Entry, dry-cut method, using Soff-Cut saws. Finisher must have documented successful experience in the use of this method prior to this project. Install cuts within one to four hours, depending on air temperature, after final finish as soon as the concrete surface is firm enough to not be torn or damaged by the blade at each saw cut location. Use 1/8 inch thick blade, cutting to a depth of one quarter of the slab thickness but not less than one inch. Cut to a depth

- of one third of the slab thickness for slabs reinforced with steel fibers or synthetic fibers.
- b. Optional Method (where Soff-Cut System method equipment is not available, subject to limitations): This method may not be used when there is no dowel passing through the contraction joint. Use a conventional saw to cut joints within four to 12 hours after finishing as soon as the concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw. Complete cutting before shrinkage stresses become sufficient to produce cracking. Use 1/8 inch thick blade, cutting to a depth of one quarter of the slab thickness but not less than one inch. Cut to a depth of one third of the slab thickness for slabs reinforced with steel fibers.
2. Formed Joints: Form contraction joints by inserting premolded plastic hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. The depth is to be one quarter of the slab thickness, but not less than one inch. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
 3. Joint Filler: Provide in both contraction and saw-cut construction joints when specified.
 - a. Remove dirt and debris from the joint by vacuuming immediately prior to filling joint. Clean the joint of curing compounds and sealers.
 - b. Filler material shall be applied to the joints when the building is under permanent temperature control, but no less than 90 days after slab construction.
 - c. Follow the manufacturer's recommended procedure for installing filler material. The joint filler must be flush with the adjacent concrete. A concave profile on the top of the joint filler is unacceptable and will be grounds for removal and replacement.
 4. The Contractor shall protect the joints from damage caused by wheeled traffic or other sources during construction until a joint-filler material (if specified) has been installed.

3.4 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is 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 unless directed otherwise by these specifications. Install reglets to receive top edge of foundation sheet waterproofing where specified by the Architect, and to receive thru-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles and other conditions.
- B. 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.

- C. Do not install sleeves in any concrete member except where shown on the structural drawings or approved by the Architect and Engineer.
- D. Securely fasten embedded plates, angles, anchor rods and other items to be built into the concrete to the formwork or hold in place with templates. Insertion of these items into concrete after concrete placement is prohibited.

3.5 CONCRETE PLACEMENT

- A. Pre-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. Moisten wood forms immediately before placing concrete where form coatings are not used.
- B. Concrete Batch Trip Tickets: The Contractor shall collect and retain concrete batch trip tickets. Compressive strength, slump, air content, and temperature tests shall be identified by reference to a particular trip ticket. Tickets shall contain the information specified in ASTM C 94. Each ticket shall also show the amount of water that may be added in the field for the entire batch that will not exceed the specified water cement ratio for the design mixture. The Contractor and Testing Laboratory shall immediately notify the Architect/Engineer and each other of tickets not meeting the criteria specified.
- C. Causes for Rejection of Concrete: The Contractor shall reject concrete delivered to the site for any of the following reasons:
 - 1. Wrong class of concrete (incorrect design mixture number).
 - 2. Environmental condition limits shall be as follows unless appropriate provisions in concrete practices have been made for cold or hot weather:
 - a. Cold Weather: Air temperature must be 40°F and rising or the average daily temperature cannot have been lower than 40°F for three consecutive days unless the temperature rose about 50°F for at least one-half of any of those 24 hour periods.
 - b. Hot Weather: Environmental conditions must be such that cause an evaporation rate from the concrete surface of 0.2 pounds per square foot per hour or less as determined by the figure "NRMCA Nomograph for Estimating Evaporation Rate on the Basis of Menzel Formula" in Appendix A of ACI 305.1.
 - c. Concrete may be placed at other environmental condition ranges only with the approval of the job inspector for the Testing Laboratory or other duly appointed representative.
 - 3. Concrete with temperatures exceeding 95°F.
 - 4. Air contents outside the limits specified in the design mixtures.
 - 5. Slumps outside the limits specified.
 - 6. Water added to the mix that exceeds the maximum allowed water-to-cementitious material ratio.
 - 7. Excessive Age: Concrete shall be discharged within 90 minutes of plant departure or before it begins to set if sooner than 90 minutes and it shall be

discharged before the drum has revolved 300 revolutions, unless approved by the Testing Laboratory job inspector or other duly appointed representative.

- D. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.
- E. Comply with ACI 301 and as herein specified:
1. Concrete Temperature: The maximum acceptable concrete temperature at the truck discharge point shall be 95°F.
 2. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation. Spread concrete using short-handled, square-ended shovels, or come-alongs.
 3. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and 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.
 4. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use internal vibrators of the largest size and power that can properly be used in the work.
 5. Do not vibrate Self-Consolidating Concrete.
 6. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to penetrate rapidly placed layer and at least 6" into preceding layer. Do not insert vibrators into lower 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 segregation of mix.
 7. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed. Place concrete for beams, girders, brackets, column capitals, haunches, and drop panels at the same time as concrete for slabs. Do not place concrete over columns and walls until concrete in columns and walls is no longer plastic and has been in place at least one hour.
 8. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners of forms, eliminating air and stone pockets that may cause honeycombing, pitting, or planes of weakness.
 9. Bring slab surfaces to correct level with straightedge and strikeoff. Use highway straightedges, bull floats, or darbies to smooth surface free of humps or hollows before excess moisture or bleedwater appears on the surface. Do not disturb slab surfaces prior to beginning finishing operations.
 10. Maintain reinforcing in proper position during concrete placement operations.
 11. Protect adjacent finish materials against damage and spatter during concrete placement.
 12. Placing Concrete by Pump: If concrete is placed by using a pump, the grout used for pump priming must not become a part of the completed structure

unless an engineered grout design mix and grout location are approved in advance by the Engineer.

3.6 FINISH OF FORMED SURFACES

- A. General: Formed surfaces shall have the finishes as described below and as shown on the drawings after formwork is removed and repairs made.
- B. Matching Mockup Finish: In all areas where a special finish is required or a mock-up is required below, Contractor shall prepare a 100 square foot mock-up to match the required finish. The mock-up should match the finish on a sample panel furnished to the Contractor. If a sample is not furnished, provide finish to match SF2.0 or any other finish specified for the project. Protect mock-up from damage for the duration of project. Approval of mock-up by Architect is required before proceeding with application of finish in project.
- C. Classifications and Finish Requirements:
 - 1. Surface Finish 1.0 (SF-1.0):
 - a. No formwork facing material is specified.
 - b. Patch voids larger than 1-1/2 inch wide or 1/2 inch deep.
 - c. Remove projections larger than 1.0 inch.
 - d. Provide surface tolerance Class D as specified in ACI 117.
 - e. Tie holes need not be patched.
 - 2. Surface Finish 2.2 (SF-2.2):
 - a. Provide specified formwork-facing material.
 - b. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
 - c. Patch tie holes.
 - d. Remove projections larger than 1/4 inch.
 - e. Provide surface tolerance Class B as specified in ACI 117.
- D. Standard Finish: Provide SF-1.0 on all concrete surfaces not exposed to view in the final condition unless otherwise specified.
- E. Exposed Finishes: Provide SF-2.2 on all concrete surfaces exposed to view in final condition unless otherwise specified.
- F. Related Unformed Surfaces: At tops of walls, horizontal offsets and similar unformed 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.

3.7 MONOLITHIC SLAB FINISHES

- A. Place, consolidate, strike off, and level concrete, eliminating high spots and low spots, before proceeding with any other finish operation. Do not add water to the surface of the concrete during finishing operation.

- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated. After screeding, consolidating and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using a hand float, a bladed power float equipped with float shoes, or a powered disk float, when the bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit the operation. Check and level surface plane to a tolerance as specified below. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- C. Non-Oxidizing Metallic Floor Hardener: Slabs in areas noted on the drawings shall receive an application of the non-oxidizing, metallic floor hardener applied at the rate of 150 pounds per 100 square feet. Immediately following the first floating operation using wood floats, uniformly distribute approximately two thirds of the required weight of the hardener over the concrete surface by mechanical spreader and embedded by means of power floating using float shoes or pan floats. The hardener shall be floated in and the second application made. The surface shall be floated again to bond properly the hardener to the base concrete slab. The surface shall then be troweled at least twice to a smooth dense finish.

3.8 CONCRETE FINISH MEASUREMENT AND TOLERANCES

- A. Testing Procedure: ASTM E 1155.
- B. Tolerance on Floor Elevations: Construction tolerance on absolute floor elevation from the specified elevation as shown on the drawings shall be as specified below, taken from ACI 117:
 - 1. Slab-on-Grade Construction: $\pm 3/4"$.
 - 2. Top Surfaces of Formed Slabs Measured Prior to Removal of Supporting Shores: $\pm 3/4"$.
 - 3. Top Surfaces of All Other Slabs: $\pm 3/4"$.
- C. Random Traffic Floor Finish Tolerances:
 - 1. Specified overall values for flatness (SOF_F) and levelness (SOF_L) shall conform to the values listed below for the floor surface classification noted for each slab category noted.
 - a. Conventional:
 - 1) SOF_F: 20.
 - 2) SOF_L: 15.
 - b. Moderately Flat:
 - 1) SOF_F: 25.
 - 2) SOF_L: 20.

- c. Flat:
 - 1) SOF_F: 35.
 - 2) SOF_L: 25.
 - d. Very Flat:
 - 1) SOF_F: 45.
 - 2) SOF_L: 35.
 - e. Super Flat:
 - 1) SOF_F: 60.
 - 2) SOF_L: 40.
- 2. Minimum local values for flatness (MLF_F) and levelness (MLF_L) shall equal 3/5 of the SOF_F and SOF_L values, respectively, unless noted otherwise. The MLF_F and MLF_L values shall apply to the minimum areas bounded by the column lines and half-column lines, or the minimum areas bounded by the construction and contraction joints, whichever are the smaller areas.
 - 3. The SOF_L and MFL_L tolerance values shall apply only to level slabs-on-ground or to level, uncambered suspended slabs that are shored such that it cannot deflect from the time the floor is placed to the time it is measured.
 - 4. Slabs specified to slope shall have a tolerance from the specified slope of 3/8" in 10 feet at any point.
- D. Construction Requirements to Achieve Specified Floor Finish Tolerances:
- 1. Forms shall be properly leveled, in good condition, and securely anchored including special attention to ends and transitions.
 - 2. Bearing surfaces for straightedges such as form edges or previously poured slabs shall be kept clean of laitance, sand, gravel, or other foreign elements.
 - 3. Screeds shall be maintained in good condition with true round rolling wheels and level cutting edges. The use of optical sighting equipment such as lasers is recommended for checking levelness and straightness. The Contractor shall promptly adjust or replace equipment when test results indicate substandard work.
 - 4. Highway straightedges are recommended for use in lieu of bullfloats for all slab placement and finishing operations. If mineral, non-oxidizing metallic, or metallic floor hardeners are used, the slab shall be wood bullfloated immediately after the straightedge.
- E. Contractor Responsibility for Concrete Floor Finish Requirements: Floor finish requirements shown below (flatness and levelness tolerances) are minimum requirements that apply unless stricter requirements are contained in instructions for installation of applied floor products in which case the Contractor is responsible for attaining the values prescribed by the manufacturer of such products.
- F. Concrete Floor Finish Tolerance for Slab-on-Grade Construction:
- 1. Concrete Placement: Concrete shall be placed and screeded to predetermined marks set to elevations prescribed on the drawings.
 - 2. Finish Tolerances of Random Traffic Floor Surfaces:

- a. Slabs in nonpublic areas, mechanical rooms, surfaces to received raised computer flooring, surfaces to have thick-set tile or a topping, and parking structures: Conventional.
 - b. Carpeted Areas: Moderately Flat.
 - c. Exposed Slabs in Public Spaces, Slabs to Receive Thin-Set Flooring: Flat.
 - d. Event Level Slabs: Very Flat.
- G. Concrete Floor Finish Tolerance – Unshored Steel Deck on Shored or Unshored Steel Beam or Steel Joist Floor Construction:
1. Concrete Placement: Concrete over steel deck shall be placed and screeded level and flat to the tolerance specified below, maintaining at least the minimum slab thickness at all locations as specified on the drawings. The Contractor shall increase the slab thickness as required to compensate for steel deck deflection, and in unshored beam construction, residual beam camber and beam deflection in order to achieve a level and flat floor within specified tolerances.
 2. Finish Tolerance of Random Traffic Floor Surfaces:
 - a. Slabs in Nonpublic Areas, Mechanical Rooms, Surfaces to Received Raised Computer Flooring, Surfaces to Have Thick-Set Tile or a Topping, and Parking Structures: Conventional.
 - b. Carpeted Areas: Moderately Flat.
 - c. Exposed slabs in public spaces, slabs to receive thin-set flooring: Flat.
 - d. Eighty percent (80%) of the final floor surface shall fall within an envelope of 0.75" centered about the mean elevation of all the readings. The mean elevation of all readings shall not deviate from the specified design grade by more than ± 0.375 ".
 3. Extra Concrete: The Contractor shall include in his bid any additional concrete required to achieve the specified slab surface finish tolerance and to compensate for steel deck deflection, beam camber and beam deflection.
 4. Concrete Placement at Column Bays Supported on Transfer Girders or Trusses: Concrete in floor areas supported by transfer girders or trusses shall be placed and screeded to predetermined marks placed over the steel deck slab conforming to elevations as specified on the drawings. At least the minimum slab thickness, as specified on the drawings, shall be maintained throughout the slab surface. The Contractor shall conform to the F_F values specified above.
- H. Remedial Measures for Slab Finish Construction Not Meeting Specified Tolerances:
1. Application of Remedial Measures. Remedial measures specified herein are required whenever either or both of the following occur:
 - a. The composite overall values of F_F or F_L of the entire floor installation measure less than specified values.
 - b. Any individual test section measures less than the specified absolute minimum F_F or F_L value.
 2. Modification of Existing Surface:

- a. If, in the opinion of the Architect/Engineer or Owner's Representative, all or any portion of the substandard work can be repaired without sacrifice to the appearance or serviceability of the area, then the Contractor shall immediately undertake the approved repair method.
- b. The Contractor shall submit for review and approval a detailed work plan of the proposed repair showing areas to be repaired, method of repair, and time to affect the repair.
- c. Repair method(s), at the sole discretion of the Architect/Engineer or Owner's Representative, may include grinding (floor stoning), planing, retopping with self-leveling underlayment compound or repair topping, or any combination of the above.
- d. The Architect/Engineer or Owner's Representative maintains the right to require a test repair section using the approved method of repair for review and approval to demonstrate a satisfactory end product. If, in the opinion of the Architect/Engineer or Owner's Representative, the repair is not satisfactory an alternate method of repair shall be submitted or the defective area shall be replaced.
- e. The judgment of the Architect/Engineer or Owner's Representative on the appropriateness of a repair method and its ability to achieve the desired end product shall be final.
- f. All repair work shall be performed at no additional cost to the Owner and with no extension to the construction schedule.

3. Removal and Replacement:

- a. If, in the opinion of the Architect/Engineer or Owner's Representative, all or any portion of the substandard work cannot be satisfactorily repaired without sacrifice to the appearance or serviceability of the area, then the Contractor shall immediately commence to remove and replace the defective work.
- b. Replacement section boundaries shall be made to coincide with the test section boundaries as previously defined.
- c. Sections requiring replacement shall be removed by sawcutting along the section boundary lines to provide a neat clean joint between new replacement floor and existing floor.
- d. The new section shall be reinforced the same as the removed section and doweled into the existing floor as required by the Engineer. No existing removed reinforcing steel may be used. All reinforcing steel shall be new steel.
- e. Replacement sections may be retested for compliance at the discretion of the Architect/Engineer or Owner's Representative.
- f. The judgment of the Architect/Engineer or Owner's Representative on the need for replacement shall be final.
- g. All replacement work shall be performed at no additional cost to the Owner and with no extension to the construction schedule.

3.9 CONCRETE CURING AND PROTECTION

A. General:

1. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Maintain concrete with minimal moisture loss at a

- relatively constant temperature for the period necessary for hydration of the cement and hardening of concrete. Limit moisture loss to a maximum of 0.05 pounds per square foot per hour for concrete containing silica fume and 0.2 pounds per square foot per hour for all other concrete before and during finishing operations. If using an evaporation retarder, apply in accordance with manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
2. Curing shall commence as soon as free water has disappeared from the concrete surface after placing and finishing. The curing period shall be seven days for all concrete except high early strength concrete that shall be cured for three days minimum.
 3. Curing shall be in accordance with ACI 301 procedures. Avoid rapid drying at the end of the curing period.
- B. Curing Formed Surfaces: Where wooden forms are used, 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. When forms are removed, continue curing by one or a combination of the methods specified below, as applicable:
1. Columns and Shear Walls Not Exposed to View: Moist cure in forms or by one or a combination of Methods 1, 2, or 3 specified below. Use a high-solids, liquid membrane-forming curing and sealing compound conforming to ASTM C 1315, Type I, Class A or B for Method 3.
 2. Columns and Shear Walls Exposed to View: Moist cure in forms or by one or a combination of Methods 1, 2, or 3 specified below. Use a high-solids, non-yellowing, liquid membrane-forming curing and sealing compound conforming to ASTM C 1315, Type 1, class A for Method 3.
 3. Sides and Soffits of Beams and Pan-Joist Ribs, Soffits of Slabs: Moist cure in forms or by one or a combination of Methods 1, 2, or 3 specified below. Use a liquid membrane-forming dissipating resin curing compound conforming to ASTM C 309, Type 1, class A or B for Method 3.
 4. Basement Walls, Sides of Exterior Retaining Walls: Moist cure in forms or by one or a combination of Methods 1, 2, or 3 specified below. Use a liquid membrane-forming dissipating resin curing compound conforming to ASTM C 309, Type 1, class A or B for Method 3.
- C. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by one or a combination of the methods specified below, as applicable. The Contractor shall choose a curing method that is compatible with the requirements for subsequent material usage on the concrete surface.
1. Ramps and Horizontal Surfaces of Parking Areas, Exposed Exterior Balconies: Cure using only Methods 1 or 2 as specified below.
 2. Floors Directly Exposed to Vehicular or Foot Traffic [Not in Parking Areas] and Not Otherwise Receiving a Chemical Hardener or Penetrating Sealer Finish: Apply two coats of a high-solids, water-based, non-yellowing, liquid membrane-forming curing and sealing compound conforming to ASTM C 1315, Type 1, Class A in accordance with Method 3 as specified below.
 3. Floors in Non-Public Spaces that are Left Exposed to View and Not Receiving Sealers or Hardeners, Floors Involved in Under-Floor Air Distribution Systems: Apply one coat of a high-solids, water-based, non-yellowing, liquid

- membrane-forming curing and sealing compound conforming to ASTM C 1315, Type 1, Class A or B in accordance with Method 3 as specified below.
4. Floors that are to Receive Subsequent Cementitious Toppings, Sealers, Hardeners, Ceramic Tile, Acrylic Terrazzo, Vinyl Composition Tile, Sheet Vinyl, Linoleum, Vinyl-Backed Carpet, Rubber, Athletic Flooring, Synthetic Turf, Wood, Epoxy Overlay or Adhesive, or Other Coating or Finishing Products: Cure using Methods 2 or 3 as specified below. Use a water-based dissipating resin type curing compound conforming to ASTM C 309, Type 1, class A or B for Method 3.
 5. All Other Surfaces: Cure using Methods 1, 2, or 3 as specified below. Use a water-based dissipating resin type curing compound conforming to ASTM C 309, Type 1, class A or B for Method 3.

D. Curing Methods:

1. Method 1 – Moisture Curing: Provide moisture curing by one of the following methods:
 - a. Keep 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. Method 2 – Moisture-Retaining Cover Curing: Provide moisture-retaining cover curing as follows:
 - a. Cover concrete surfaces with moisture-retaining 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. Water may be added to concrete surface to prevent drying before the cover is installed, but the surface shall not be flooded with water if a non-absorptive cover is used.
3. Method 3 – Curing or Curing and Sealing Compound: Provide curing, liquid membrane-forming curing, or curing and sealing compound as follows:
 - a. Apply specified compound to concrete slabs as soon as final finishing operations are complete (within two hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Do not allow to puddle. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period. Apply second coat for sealing two to three hours after the first coat was applied.
 - b. Do not use membrane-forming curing and sealing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glued-down carpet, vinyl composition tile, linoleum, sheet vinyl, rubber, athletic flooring, synthetic turf, or wood), paint, or other coatings and finish

materials. Dissipating resin type cures are acceptable in these locations.

3.10 HOT WEATHER CONCRETING

A. Definition:

1. Conditions warranting hot weather concreting practices are defined as any combination of high air temperature, low relative humidity, and wind velocity tending to impair the quality of fresh or hardened concrete or otherwise result in abnormal properties. If conditions cause an evaporation rate of 0.2 pounds per square foot per hour or greater as calculated by the figure "NRMCA Nomograph for Estimating Evaporation Rate on the Basis of Menzel Formula" in Appendix A of ACI 305.1, then precautions shall be taken to prevent plastic shrinkage cracks from occurring.

- #### B. Specification:
- Follow hot weather concreting practices specified below when required to limit the concrete temperature at the truck discharge point to the stated maximum acceptable temperature.

- #### C. Records:
- Under hot weather conditions, the Contractor shall keep records of outside air temperature, concrete temperature at truck discharge and general weather conditions.

- #### D. Hot Weather Concreting Requirements:
- The following items, all or in part as required, shall be followed to limit the concrete temperature to the stated maximum acceptable temperature and to minimize the possibility of plastic shrinkage cracks from developing.

1. Design the concrete mixtures specifically for hot weather conditions replacing some cement with fly ash or other pozzolan and using a water reducing retarding admixture (ASTM C 494 Type D).
2. Use the largest size and amount of coarse aggregate compatible with the job.
3. Use sunshades and/or windbreaks.
4. Delay construction of indoor slabs-on-grade until the walls and roof are constructed.
5. Cool and shade aggregate stockpiles.
6. Use ice as part of the mixing water or cool the water with liquid nitrogen. Do not place concrete that contains unmelted ice.
7. Limit the number of revolutions at mixing speed to 125 maximum.
8. Reduce time between mixing and placing as much as possible.
9. Do not add water to ready-mixed concrete at the job site unless it is part of the amount required initially for the specified water-cement ratio and the specified slump.
10. Schedule concrete placement for early morning, late afternoon, or night.
11. Have all forms, equipment, and workers ready to receive and handle concrete.
12. Maintain one standby vibrator for every three vibrators used.
13. Keep all equipment and material cool by spraying with water including exteriors of forms, reinforcing steel, subgrade, chutes, conveyors, pump lines, tremies, and buggies.

14. Protect slab concrete at all stages against undue evaporation by applying a fog spray or mist above the surface or applying a monomolecular film. Where high temperatures and/or placing conditions dictate, use water-reducing retarding admixture (Type D) in lieu of the water-reducing admixture (Type A) as directed by the Owner's Testing Laboratory.
15. Provide continuous curing, preferably with water, during the first 24 hours using wet burlap, cotton mats, continuous spray mist, or by applying a curing compound meeting ASTM C 1315. Continue curing for three days minimum.
16. Cover reinforcing steel with water soaked burlap so that steel temperature will not exceed ambient air temperature immediately before placement of concrete.
17. As soon as possible, loosen forms and run water down the inside. When forms are removed, provide a wet cover to newly exposed surfaces.

3.11 COLD WEATHER CONCRETING

A. Definition:

1. Concrete shall not be placed when the outside air temperature is 40°F or less unless cold weather concreting practices are followed as specified below.
2. Cold weather concreting practices should also be followed whenever the average daily air temperature is expected to be less than 40°F for more than three successive days. The average daily air temperature is the average of the highest and lowest temperature occurring during the period from midnight to midnight. The requirement for adhering to these cold-weather concreting practices may be terminated when the air temperature is above 50° F for more than half of any 24 hour duration.
3. Cold-weather concreting practices invoked shall keep the temperature of the concrete immediately after placing within the following temperature ranges:
 - a. 55° to 75° F for sections less than 12 inches in the least dimension.
 - b. 50° to 70° F for sections 12 to 36 inches in the least dimension.
 - c. 45° to 65° F for sections 36 to 72 inches in the least dimension.
 - d. 40° to 60° F for sections greater than 72 inches in the least dimension.
4. Concrete Protection: Protect the concrete immediately after placing and during the defined protection period such that the concrete does not freeze nor fall below the temperature levels stated in the above paragraph. For concrete not loaded during construction, the protection period shall be for a minimum of three days if cold-weather conditions persist. The time may be reduced to a minimum of two days if Type III cement or an accelerating admixture is used or if an additional 100 pounds of cement per cubic yard is added to the concrete mix. Concrete fully loaded during construction shall be protected during cold weather conditions for whatever time is required to obtain the required strength as determined by nondestructive strength tests (Windsor probe, Swiss Hammer Test) on the in-place concrete. Protect concrete surfaces from freezing for the first 24 hours even if cold-weather conditions do not officially exist due to high volatility in ambient temperatures.
5. Protection Deficiency: If the temperature requirements during any portion of the protection period are not met but the concrete surface did not freeze, the protection period shall be extended until twice the deficiency expressed in

- degree-hours is made up. Deficiency degree-hours are defined as the average deficiency in temperature below the required value times the number of hours the deficiency persisted. Make-up degree hours are the average increase in temperature above the minimum value times the hours required to make up twice the deficiency degree-hours. Contact the Architect/Engineer if the concrete surface was allowed to freeze during the protection period.
6. Protection Removal: As the protection is being removed the decrease in temperature measured at the surface of the concrete in a 24 hour period shall not exceed the following:
 - a. 50° F for sections less than 12 inches in the least dimension.
 - b. 40° F for sections 12 to 36 inches in the least dimension.
 - c. 30° F for sections 36 to 72 inches in the least dimension.
 - d. 20° F for sections greater than 72 inches in the least dimension.
 7. The maximum concrete temperature heated by artificial means at point of placement shall not exceed 90°F.
- B. Records: Under cold weather conditions, the Contractor shall keep records of outside air temperature, concrete temperature as placed and general weather conditions. The temperature record shall be taken no less than two times per 24 hour duration.
- C. Cold Weather Concreting Requirements: The following items, all or in part as required, should be followed to assure acceptable concrete in cold weather conditions:
1. Design the concrete mixture to obtain high early strength by using higher cement content, a high early strength cement (Type III), or a specified non-chloride accelerator (ASTM C 494 Type C or E).
 2. Protect the concrete during curing period using insulating blankets, insulated forms, enclosures, and/or heaters.
 3. Concrete cured in heated enclosures shall have heaters vented to prevent exposure of concrete and workmen to noxious gases.
 4. Frozen subgrade shall be thawed prior to concrete placement and snow and ice shall be removed from forms.
 5. Temperature of embedments in concrete must be heated to above 32°F prior to placing concrete
 6. Heat the mixing water and then blend hot and cold water to obtain concrete no more than 10°F above the required temperature.
 7. Heat the aggregates by circulating steam in pipes placed in the storage bins for air temperatures consistently below 32°F. When either water or aggregate is heated to over 140°F, combine them in the mixer first to obtain a maximum temperature of the mixture not to exceed 140°F in order to prevent flash set of the concrete.
 8. Uniformly thaw aggregates far in advance of batching to prevent moisture variations in the stockpile.
 9. Cover warmed stockpiles with tarps to retain heat.
 10. Place air entraining admixture in the batch after the water temperature has been reduced by mixing with cooler solid materials.
 11. Use wind screens to protect concrete from rapid cooling.

12. Place vertical pump lines inside the building, if possible, for concrete being pumped.
13. Maintain artificial heat as low as possible to reduce temperature stresses during cooling.
14. Avoid water curing of concrete except for parking garage structures. Apply the required curing compound to unformed surfaces as soon as possible to prevent drying of concrete from heated enclosures.
15. Delay form stripping as long as possible to help prevent drying from heated enclosures and to reduce damage to formed surfaces caused by premature stripping.
16. Provide triple thickness of insulating materials at corners and edges vulnerable to freezing.
17. Wrap protruding reinforcing bars with insulation to avoid heat drain from the warm concrete.
18. Gradually reduce the heat at the end of the heating period to reduce likelihood of thermal shock.

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 filling 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, as shown on drawings. Set anchor rods for machines and equipment to template 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. Adhesive Anchors: All drilled holes for adhesive anchors shall be within six degrees of perpendicular to the surface of the concrete member.

3.13 INVESTIGATION OF LOW CONCRETE STRENGTH TEST RESULTS

- A. Contractor Responsibility for Low Strength Concrete:
 1. If the average of any three consecutive strength tests falls below the required $f'c$ for a class of concrete but no individual strength test is more than 500 PSI below the required $f'c$, the Contractor shall immediately notify the Engineer by telephone or email and take immediate steps to increase the average of subsequent strength tests.

2. If any individual strength test falls more than 500 PSI below the required $f'c$, the Contractor shall immediately notify the Engineer by telephone or e-mail and take immediate steps to assure that the load-carrying capacity of the structure is not jeopardized.

B. Additional Field Tests to Confirm Low Concrete Strengths:

1. The cost of all investigations of low-strength concrete, as defined by any individual strength test being more than 500 PSI below the required $f'c$, shall be borne by the Contractor.
2. Code-Prescribed Acceptance: The only accepted field-test methods of determining actual in-situ concrete strength is by the way of core tests as prescribed by ACI 318.
3. Non-Destructive Tests: If any individual strength test falls more than 500 PSI below the required $f'c$, the Engineer may request that non-destructive field tests be performed on the concrete in question using Swiss Hammer, Windsor Probe, or other appropriate methods as approved by the Engineer. Report the comparative test results of the suspect concrete under consideration with identical tests done on concrete of known strength and of the same class. The Engineer considers these test results as only approximate indicators of strength and may not necessarily, by themselves, resolve the low concrete strength issue. These test results will be considered as additional information by which to make an informed judgment. The Engineer reserves the right to accept the concrete based on the results of these approximate tests or order that core tests be taken as prescribed below. At the Contractor's option, the approximate non-destructive field-tests may be waived and core tests immediately initiated.
4. Core Tests: If, in the opinion of the Engineer, the likelihood of low-strength concrete is confirmed and it has been determined that the load-carrying capacity of the structure is significantly reduced as a result, the Engineer may request that core tests be taken from the area in question as directed by the Engineer. There shall be a minimum of three cores taken for each strength test more than 500 PSI below the required $f'c$ in accordance with ASTM C 42. If concrete in the structure will be dry under service conditions, cores shall be air dried (temperature 60° to 80°F, relative humidity less than 60 percent) for seven days before test and shall be tested dry. If concrete in the structure will be more than superficially wet under service conditions, cores shall be immersed in water for at least 40 hours and tested wet. The Contractor shall fill all holes made by drilling cores with an approved drypack concrete.
5. Acceptance Criteria for Core Test: Concrete in an area represented by core tests shall be considered adequate if the average of three cores is equal to at least 85% of the required $f'c$ and no single core is less than 75% of the required $f'c$. If approved by the Engineer, locations of erratic core strengths may be retested to check testing accuracy.
6. Load Test: If the concrete strength is not considered adequate based on core tests and the structural adequacy remains in doubt, the Engineer may order a load test as specified in ACI 318 be conducted for the questionable portion of the structure.
7. Strengthening or Demolition of the Structure: If the structural adequacy of the affected portion of the structure remains in doubt following the load test, the Engineer may order the structure to be strengthened by an appropriate means or demolished and rebuilt at the Contractor's expense.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Areas:

1. Formed Surfaces: Concrete surfaces requiring repairs shall include all cracks in excess of 1/32" in width and any other defects that affect the durability or structural integrity of the concrete. Voids, including honeycombing and rock pockets, and tie holes shall be repaired as required by the specified Surface Finish.
2. Unformed Surfaces: Concrete surfaces requiring repair shall include all surface defects such as crazing, cracks in excess of 1/32" in width or cracks that penetrate to reinforcement or through the member, popouts, spalling, and honeycombs.

B. Classification:

1. Structural Concrete Repair: Major defective areas in concrete members that are load carrying (such as shear walls, beams, joists and slabs), are highly stressed, and are vital to the structural integrity of the structure shall require structural repairs. Structural concrete repairs shall be made using a two-part epoxy bonder, epoxy mortar, or specified polymer repair mortar. The Engineer shall determine the locations of required structural concrete repairs.
2. Cosmetic Concrete Repair: Defective areas in concrete members that are non-load carrying and minor defective areas in load carrying concrete members shall require cosmetic concrete repair when exposed to view and not covered up by architectural finishes. Cosmetic concrete repairs may be made using a polymer repair mortar and compatible bonding agent. The Architect/Engineer shall determine the locations of required cosmetic concrete repairs. Stains and other discolorations that cannot be removed by cleaning and are exposed to view will require cosmetic repair. Cosmetic concrete repair in exposed-to-view surfaces will require Architect's approval prior to patching operation.
3. Slab Repairs: High and low areas in concrete slabs shall be repaired by removing and replacing defective slab areas unless an alternate method, such as grinding and/or filling with self-leveling underlayment compound or repair mortar is approved by the Architect/Engineer. Repair of slab spalls and other surface defects shall be made using epoxy products as specified above and as determined by the Engineer. The high strength flowing repair mortar may be used for areas greater than one inch in depth.

3.15 FIELD QUALITY CONTROL

- A. Field Testing and Inspection: Refer to Specification 01 45 29 "Structural Testing and Inspections" for testing and inspection requirements associated with cast-in-place concrete.

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SECTION 03 35 43

POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polished concrete finishing.
2. Concrete for polished concrete, including concrete materials, mixture design, placement procedures, initial finishing, and curing is specified in Section 03 30 00 "Cast-in-Place Concrete."

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of all joints, including construction joints.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each of the following, signed by manufacturers:
 1. Repair materials.
 2. Liquid floor treatments.

1.4 QUALITY ASSURANCE

- A. Mockups: Before casting concrete, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 2. Demonstrate curing, finishing, and protecting of polished concrete.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: Provide polished flooring that has been selected, manufactured and installed to achieve the following:
1. Abrasion Resistance: ASTM C779, Method A, high resistance, no more than 0.008-inch (0.20 mm) wear in 30 minutes.
 2. Reflectivity: Increase of 35% as determined by standard gloss meter.
 3. High Traction Rating: NFSI B101.1, ph. 2 non-slip properties.
 4. Ultra-violet Light and Water spray: ASTM G 23-81 – No adverse effect to ultraviolet light and water spray.
 5. Static Coefficient of Friction: Products and polishing operations shall achieve following as determined by quality control testing according to NFSI 101-A:
 - a. Level Floor Surfaces: Minimum 0.6.
 - b. Sloping Floor Surfaces: Minimum 0.8.

2.2 SYSTEM SCHEDULE

- A. Polished Concrete – RetroPlate Polishing System applied to natural Gray Concrete. Spiff coats: 2 coats of RetroGuard.
1. Level of Grinding: Class B Fine Aggregates, Salt and Pepper Finish.
 2. Sheen: Level 4, 800 grit Highly Polished.

2.3 LIQUID FLOOR TREATMENTS

- A. Hardener, Penetrating Sealer, Densifier: Proprietary, water based, odorless liquid, VOC compliant, environmentally safe chemical hardening solution leaving no surface film.
1. Basis of Design: Advanced Floor Products; RetroPlate 99 System.
 2. Verify products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Stain Repellent (non-film forming): Water based, co-polymer blend of silicates and polymeric; formulated to resist damage from water, chemical attack, and abrasion.
1. Basis of Design: Advanced Floor Products; RetroGuard.
 2. Color: Clear.
 3. Verify products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 ACCESSORY MATERIALS

- A. Joint Filler: Semi-rigid, 2-component, self-leveling, 100% solids, rapid curing, polyurea control joint and crack filler with Shore A 80 or higher hardness
 - 1. Basis of Design: Advanced Floor Products; CreteFill Pro Series
 - 2. Color: As selected by Architect from manufacturer's full range of colors.
- B. Patching Compound: Description: 2 component; Urethane spall and crack repair.
 - 1. Basis of Design: Advanced Floor Products; CreteFill Pro Series.
 - 2. Color: As selected by Architect from manufacturer's full range of colors.
- C. Grout Material: Description: Clear modified silicate sealant, containing no pore clogging latex, when mixed with dust salvaged from grinding process forms a paste that reacts with calcium hydroxide in concrete that hardens when surface imperfections are filled.
 - 1. Basis of Design: Advanced Floor Products; GroutFill.
- D. Protective Cover: Non-marking, breatheable barrier.

2.5 POLISHING EQUIPMENT

- A. Field Grinding and Polishing Equipment:
 - 1. Variable speed, 3 or 4 head counter-rotating, walk-behind machine with not less than 600 lbs of down pressure on grinding or polishing pads.
 - 2. Dust extraction equipment with flow rate suitable for dust generated, with pre-separator and squeegee attachments.
- B. Edge Grinding and Polishing Equipment: Hand-held or single head walk-behind machines which produces same results, without noticeable differences, as field grinding and polishing equipment.
- C. Burnishing Equipment: Single head high speed walk-behind machines. Steps to be burnished using a handheld machine
- D. Grinding Pads: Metal bonded pads with embedded industrial grade diamonds of varying grits, 40 grit minimum, fabricated for mounting on equipment.
- E. Polishing Pads: Resin bonded pads with embedded industrial grade diamonds of varying grits fabricated for mounting on equipment.
- F. Burnishing Pads: Maintenance pads coated with embedded industrial grade diamonds for use with burnishing equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification of Concrete Conditions: Installer and manufacturer's representative shall examine surfaces receiving concrete finish and polishing system.
- B. Examine surface to determine soundness of concrete for polishing.

1. Verify that surfaces conform to product manufacturer's requirements for substrate conditions.
 2. Verify floor is free of curing membrane, bond-breaker, concrete laitance, and will absorb water per water absorbency test.
 3. Bring any unforeseen conditions to the attention of the Architect and Manufacturer's Representative prior to proceeding with polished concrete finish.
- C. Verify that 'Curing Methods' are compatible and recommended by Polished Concrete Finish Manufacturer.
- D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of concrete finishing materials. Remove surface contamination.

3.3 POLISHING

- A. Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
1. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
 2. Apply reactive stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
 3. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
 4. Apply penetrating stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
 5. Continue polishing with progressively finer-grit diamond polishing pads to gloss level, to match approved mockup.
 6. Control and dispose of waste products produced by grinding and polishing operations.
 7. Cover and protect as recommended during and after the final installation of polished floor surfaces as recommended by Polished Concrete Finish Manufacturer.

3.4 CONCRETE POLISHING APPLICATION

- A. Initial Grinding: Polished Concrete Floor Finishes shall be taken up to a 800 grit prior to the walls being installed while the slab is wide open and dried in, coordinate with the General Contractor and other trades. Grind concrete to specified aggregate exposure imparting uniform scratch pattern in concrete. Vacuum floor using squeegee vacuum attachment.
- B. General:

1. Apply sealer/hardener and colored concrete dye with application equipment and polishing diamonds as recommended by manufacturer for each system scheduled.
 2. Manufacturer's Certified Applicator to install specified polishing system in accordance with manufacturer's recommended polishing grits for each intended sequence to achieve the Polishing System, and specified level of sheen.
 3. Comply with recommendations of product manufactured for drying time between succeeding coats.
 4. Recoat polished floors where there is evidence of suction spots or unsealed areas in first coat, to ensure a finish coat free of other defects due to insufficient sealing or dying.
 5. Make edges of polished concrete floor adjoining other materials clean and sharp. Detail the edges located at the base of the wall, around corners, adjacent surfaces, and all horizontal floor surfaces to match polished concrete floor finishes to provide a uniform finish to include polished concrete floor finish, color, and sheen per the Approved Mock-Up.
 6. Do not apply tape to polished concrete finish as this will damage or etch surface and the entire system will have to be re-done.
 7. Begin grinding and polishing with polished concrete floor finishes manufacturer's recommended coarse diamond grit in uniform manner and proceed to next level of polishing diamond grit sequence to complete the polishing system to match approved mock-up for aggregate exposure, polished concrete floor finish, color, and sheen.
- C. First Coat: Penetrating liquid Sealer/Hardener applied at approximately 200 SF per gallon applied to new and existing cured concrete. Applied and used in conjunction with polished concrete finish. Applied in accordance with manufacturer's latest published instructions for each intended floor finish and surface. If whitening occurs, remove and repeat steps.
- D. Polishing Steps:
1. Polish to provide indicated level of sheen per approved mockup.
 - a. Level 4 Polished Low-Sheen: 800 grit and as required to achieve uniform sheen to match approved mock-up.
 2. Apply stain repellent as recommended by Manufacturer, allowing adequate curing time between coats.
 3. Burnish each coat, with high-speed burnisher capable of 2,600 rpm's, equipped with manufacturer's recommended burnishing pads.
- 3.5 ADJUSTMENTS
- A. Remove defects and repolish defective areas.
 - B. Fill joints flush to surface.

3.6 REPAIRS

- A. Refinish all work which has become damaged or defaced during the course of construction and leave all finishing in clean, neat, and perfect condition, acceptable to the Owner. Repair or replace all damaged materials directly attributable to work under this Section.

3.7 CLEANING AND ACCEPTANCE

- A. Clean floor, and adjacent surfaces as required, prior to inspection using Manufacturer's recommended cleaners and methods.
 - 1. Touch-up and restore finish where damaged.
 - 2. Remove spilled, splashed or splattered finish material from all surfaces, as required.
 - 3. Do not mar surface finish or item being cleaned. Make necessary repairs to damaged surfaces caused by cleaning operation or installation of Polished Concrete Finish.
 - 4. During progress of work, remove from project daily all discarded materials, rubbish, containers, etc.
 - 5. Do not permit the use of water or cleaning agents at any time on completed polished concrete floor finish until said period of time is acceptable to Manufacturer's Representative and surfaces have cured for a minimum of seven days, or longer where recommended by Manufacturer.
- B. Final acceptance of Polished Concrete Floor Finish, and Sealer shall be based upon inspection by the Architect and Owner. Polished concrete floor finish, and sealer falling below specified and/or scheduled finish and approved mock-up shall be re-done as required without additional expense to the Owner.

3.8 PROTECTION

- A. Protect polished concrete flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by Installer and polishing system manufacturer.

END OF SECTION

SECTION 04 22 00
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Steel reinforcing bars.
 - 4. Masonry-joint reinforcement.
 - 5. Miscellaneous masonry accessories.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 3. Mortar admixtures.
 - 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.

5. Grout mixes. Include description of type and proportions of ingredients.
 6. Reinforcing bars.
 7. Joint reinforcement.
 8. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602 except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.3 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

2. Provide square-edged units for outside corners unless otherwise indicated.

B. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
2. Density Classification: Normal weight unless otherwise indicated.
3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.4 MASONRY LINTELS

A. General: Provide one of the following:

B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

3. White-Mortar Aggregates: Natural white sand or crushed white stone.

4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

E. Aggregate for Grout: ASTM C404.

F. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.

- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Heckmann Building Products, Inc.; #374: Steel-Wich.
 - b. Hohmann & Barnard, Inc.; RB Rebar Positioner.
 - c. Wire-Bond, Figure 8 Rebar Positioners.
- C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A951/A951M.
 - 1. Interior Walls: Hot-dip galvanized carbon steel.
 - 2. Wire Size for Side Rods: 0.148-inch diameter.
 - 3. Wire Size for Cross Rods: 0.148-inch diameter.
 - 4. Spacing of Cross Rods: Not more than 16 inches o.c.
 - 5. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.7 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into masonry but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Stainless Steel Wire: ASTM A580/A580M, Type 304.
 - 2. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.
 - 3. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 4. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, stainless steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
 - 5. Tie Section: Triangular-shaped wire tie made from 0.187-inch-stainless steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
- C. Partition Top Anchors: 0.105-inch-thick metal plate with a 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from stainless steel.
- D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
 - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from from neoprene or urethane.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.9 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime mortar unless otherwise indicated.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For masonry below grade or in contact with earth, use Type M.
 - 2. For reinforced masonry, use Type N.
 - 3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
- D. Grout for Unit Masonry: Comply with ASTM C476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 - 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Verify that substrates are free of substances that would impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.

3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 43 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs 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 where indicated to receive waterproofing unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.7 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

3.8 LINTELS

- A. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- B. Install steel lintels where indicated.
- C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.9 REINFORCED UNIT MASONRY

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches.

3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work

areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

- B. Inspections: Special inspections according to Level B in TMS 402.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
- E. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

3.11 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.12 MASONRY WASTE DISPOSAL

- A. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 04 26 13

MASONRY VENEER

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Face brick.
 - 2. Mortar.
 - 3. Ties and anchors.
 - 4. Embedded flashing.
 - 5. Miscellaneous masonry accessories.
- B. Products Installed but not Furnished under This Section:
 - 1. Steel lintels in masonry veneer.
 - 2. Steel shelf angles for supporting masonry veneer.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
- C. Samples for Verification: For each type and color of the following:
 - 1. Face brick, in the form of straps of five or more bricks.
 - 2. Special brick shapes.
 - 3. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
 - 4. Weep holes.
 - 5. Accessories embedded in masonry.

1.4 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
 - B. Material Certificates: For each type and size of the following:
 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C67.
 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 3. Mortar admixtures.
 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 5. Anchors, ties, and metal accessories.
 - C. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.
 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 - D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.
- 1.5 QUALITY ASSURANCE
- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Provide mock-up in accordance with provisions of Section 01 43 39.
 2. Build mockups for typical exterior wall of one typical brick bay by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches long in mockup.
 - b. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
 - c. Include metal studs, sheathing, air barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
 3. Clean exposed faces of mockups with masonry cleaner as indicated.
 4. Protect accepted mockups from the elements with weather-resistant membrane.

5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects will be exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

2.3 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
 - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 - 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 - 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 - 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Face Brick: Facing brick complying with ASTM C216.
 - 1. Grade: SW.
 - 2. Type: FBX.
 - 3. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C7.
 - 4. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
 - 5. Size: Manufactured to match existing brick dimensions and custom dimensions shown on the drawings.
 - 6. Application: Use where brick is exposed unless otherwise indicated.

7. Basis of Design Product: Endicott; Medium Ironspot #46.

2.4 MORTAR MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 1. Colored Portland Cement-Lime Mix:
 - a. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - 1) Essroc; i.design flamingo-BRIXMENT Blend.
 - 2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
 - 3) Lafarge North America Inc.; Eaglebond Portland & Lime.
 - 4) Lehigh Hanson; HeidelbergCement Group; Lehigh Custom Color Portland/Lime Cement.
 2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 3. Pigments shall not exceed 10 percent of portland cement by weight.
- E. Aggregate for Mortar: ASTM C144.
 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- F. Water: Potable.

2.5 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.

2. Galvanized-Steel Sheet: ASTM A653/A653M, Commercial Steel, G60 zinc coating.
3. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.

C. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.105-inch-thick steel sheet, galvanized after fabrication.
3. Fabricate wire ties from 0.187-inch-diameter, wire unless otherwise indicated.
4. Fabricate wire connector sections from 0.187-inch-diameter, hot-dip galvanized, carbon steel wire.
5. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.
6. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having holes for inserting vertical legs of wire tie formed to fit anchor section.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Heckmann Building Products, Inc.; "213" anchor section with "282" double pintle wire tie.
 - 2) Hohmann & Barnard, Inc.; HB-200/DA-213
 - 3) Wire-Bond; RJ-711.
7. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a sheet metal anchor section, 1-1/4 inches (32 mm) wide by 6 inches (152 mm) long, with screw holes top and bottom and with raised rib-stiffened strap, 5/8 inch (16 mm) wide by 3-5/8 inches (92 mm) long, stamped into center to provide a slot between strap and base for inserting wire tie.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Heckmann Building Products, Inc.; "315-D Anchor Plate with "316" Wire Tie.
 - 2) Hohmann & Barnard, Inc.; DW-10HS
 - 3) Wire-Bond; Type III Screw on Veneer Anchor.
8. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours according to ASTM B117.
9. Stainless Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads; either made from Type 410 stainless steel or made with a carbon-steel drill point and 300 Series stainless steel shank.

2.6 EMBEDDED FLASHING MATERIALS

A. Flexible Flashing:

1. Stainless Steel Core Flexible Flashing With Drainage Fabric: Engineered system, with high resistance to damage, composite sheet with a stainless steel core, non-asphalt adhesive polymer fabric laminated to one face of sheet, and non-woven drainage fabric laminated to opposing face with non-asphalt adhesive.
 - a. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.011 inch thick. Recycled content: 60%.
 - b. Provide manufacturer's standard inside- and outside-corner units.
 - c. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - 1) York Manufacturing, Inc.; Multi-Flash SS.
 - 2) STS Coatings, Inc.; Gorilla Flash Stainless Fabric.
 - 3) Hohmann & Barnard: Mighty-Flash.
 - d. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
 - e. Use only where flashing is fully concealed in masonry.
2. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees.
3. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees.
4. Fabricate metal sealant stops 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 1/4 inch to form a stop for retaining sealant backer rod.

B. Termination Bars for Flexible Flashing: Stainless steel bars 0.075 inch by 1 inch.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.
- B. Weep/Cavity Vent Products: Use one of the following unless otherwise indicated:
 1. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches long.
 2. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
 3. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Advanced Building Products Inc.; Mortar Maze Cell Vents.

- 2) CavClear/Archovations, Inc.; CavClear Weep Vents.
 - 3) Heckmann Building Products Inc.; No. 85 Cell Vents.
 - 4) Hohmann & Barnard, Inc.; QV Quadro-Vents.
 - 5) Wire-Bond; #3601 Cell Vent.
- C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advanced Building Products Inc.; Mortar Break II.
 - b. CavClear/Archovations, Inc.; Masonry Mat.
 - c. Heckmann Building Products, Inc.; #84 Weep-Thru Mortar Deflector.
 - d. Hohmann & Barnard, Inc.; Mortar Trap.
 - e. Mortar Net Solutions; Mortar Net.
 - f. Wire-Bond; Cavity Net.
 2. Configuration: Provide one of the following:
 - a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.
 - b. Strips, not less than 1-1/2 inches thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
 - c. Sheets or strips, full depth of cavity and installed to full height of cavity.
 - d. Sheets or strips not less than 1-1/2 inches thick and installed to full height of cavity, with additional strips 4 inches high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from clogging with mortar.

2.8 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
 2. Use portland cement-lime mortar unless otherwise indicated.
 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Use Type N unless another type is indicated.
1. For masonry below grade or in contact with earth, use Type M.
- D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
1. Mix to match Architect's sample.

2. Application: Use colored aggregate mortar for exposed mortar joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- D. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- E. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2-inch total.
- B. Lines and Levels:
 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- 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.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay face brick with face shells fully bedded in mortar and with head joints of depth equal to bed joints. At starting course, fully bed entire units, including area under cells.
 - 1. At anchors and ties, fully bed units and fill cells with mortar as needed to fully embed anchors and ties in mortar.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
 - 1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.

3.6 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 - 2. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 3. Space anchors as indicated, but not more than 18 inches o.c. vertically and horizontally. Install additional anchors within 12 inches of openings and at intervals, not exceeding 24 inches, around perimeter.
- B. Provide not less than 1 1/2 inch of airspace between back of masonry veneer and face of insulation.
 - 1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.7 EXPANSION JOINTS

- A. General: Install expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form expansion joints as follows:
 - 1. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 07 92 00 "Joint Sealants."
- C. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07 92 00 "Joint Sealants," but not less than 3/8 inch.
 - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.8 LINTELS

- A. Install steel lintels where indicated.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.9 FLASHING, WEEP HOLES, 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. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under air barrier, lapping at least 4 inches. Fasten upper edge of flexible flashing to sheathing through termination bar.
 - 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. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
 - 1. Use specified weep/cavity vent products to form weep holes.
 - 2. Space weep vents 24 inches o.c. unless otherwise indicated.
- D. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- E. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.
 - 1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level B in TMS 402.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
- C. Testing Prior to Construction: One set of tests.
- D. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.

- E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.

3.11 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

3.12 MASONRY WASTE DISPOSAL

- A. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 04 43 13.16

ADHERED MASONRY VENEER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior adhered masonry veneer to cementitious board over to cold-formed metal framing at columns.

B. Related Requirements:

1. Section 05 40 00 "Cold-Formed Metal Framing" for framing members.
2. Section 07 92 00 "Joint Sealants" for sealants.
3. Section 09 22 16 "Non-Structural Metal Framing" for hat channel framing.

1.2 ACTION SUBMITTALS

A. Product Data: For each variety of masonry, masonry accessory, installation materials and manufactured product.

B. Samples for Verification:

1. For each masonry type indicated. Include at least three Samples in each set and show the full range of color and other visual characteristics in completed Work.
2. For each color of mortar required. Label Samples to indicate types and amounts of pigments used.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, supply sources, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.

1. Neither receipt of list nor approval of mockups constitutes approval of deviations from the Contract Documents contained in mockups unless Architect approves such deviations in writing.

C. Material Test Reports:

1. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer, indicating that sealants will not stain or damage masonry. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs experienced masons and stone fitters.
- B. Follow manufacturer's recommendations for installation of masonry, including Laticrete system W244-E.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Sealant Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for compatibility and adhesion testing according to sealant manufacturer's standard testing methods and Section 07 92 00 "Joint Sealants," Samples of materials that will contact or affect joint sealants.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, in a dry location, or in covered weatherproof dispensing silos.

1.7 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides, and hold cover securely in place.
- B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining masonry face.

1.8 COORDINATION

- A. Advise installers of other work about specific requirements for placement of flashing and similar items to be built into masonry.

1.9 WARRANTY

- A. Provide mortar manufacturer's 10-year system warrant against failure of masonry to adhere to substrate.

PART 2 - PRODUCTS

2.1 MASONRY MANUFACTURERS

- A. Source Limitations for Masonry Veneer: Obtain each variety / type of masonry, from single quarry / manufacturer with resources to provide materials of consistent quality in appearance and physical properties.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from single manufacturer and each aggregate from single source or producer.

2.2 BV, THIN BRICK

- A. Thin Brick Veneer:
 - 1. Basis-of-Design Product: Endicott Roman Thin Brick.
 - 2. Color: Burgundy Sands.
 - 3. Texture: Square Edge, no texture.
 - 4. Kiln fired thin brick, composed of following materials:
 - a. Clay, shale, fire clay, sand or mixtures thereof, kiln fired to fusion to produce clay masonry units per ASTM C1088, Type TBS (Standard).
 - 5. Durability: ASTM C1088, Grade Interior.
 - 6. Freeze and Thawing: No breakage and not greater than 0.5% loss in dry weight when tested in accordance with ASTM C1088.
 - 7. Thin brick veneer size: 11-5/8 (L) inches by 1-5/8 (H) inches by 1/2 thick.

2.3 FASTENERS

- A. General: Provide fasteners of size and type that comply with requirements specified in this article for material and manufacture.
 - 1. Provide fasteners of Type 304 stainless steel.
- B. Screws for Fastening to Cold-Formed Metal Framing: Steel drill screws, in length recommended by manufacturer and required to penetrate steel-stud flange with not less than four exposed threads.
 - 1. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.4 CEMENTITIOUS BOARD

- A. Cementitious Backer Units: Meeting ANSI A118.9 and ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints.
 - 1. Thickness: 1/2 inch
 - 2. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - a. Custom Building Products; Wonderboard.
 - b. USG Corporation; DUROCK Cement Board.

- c. National Gypsum; Permabase.

2.5 MORTAR MATERIALS

- A. Mortar for Adhering Masonry: Provide polymer-modified veneer mortar. Premixed, cement-based, polymer-modified veneer mortar that includes a blend of select aggregates requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
 - 1. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - a. Laticrete; Masonry Veneer Mortar.
 - b. ParexUSA; Thin Veneer Adhesive.
 - B. Masonry Pointing Mortar is factory prepared and designed to be mixed with water or mortar enhancer. Formulated from a blend of high strength portland cement, graded aggregates, and color-fast pigments.
 - 1. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - a. Laticrete; Masonry Pointing Mortar.
 - b. ParexUSA; Merkrete Grout.
 - 2. Color: As selected by Architect from manufacturer's full range of colors.
- C. Water: Potable.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces indicated to receive masonry veneer, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of masonry veneer.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean dirty or stained masonry surfaces by removing soil, stains, and foreign materials before setting. Clean masonry by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 INSTALLATION OF CEMENTITIOUS BOARD

- A. Install cementitious backer units according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.4 MASONRY VENEER INSTALLATION

- A. Perform necessary field cutting as masonry is set. Use power saws to cut masonry. Cut lines straight and true, with edges eased slightly to prevent snipping.
- B. Sort masonry units before it is placed in wall to remove masonry units that do not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
- C. Clean backs of masonry to remove any contaminants that may prevent bonding of the mortar. Coat backs of masonry units and edges with setting mortar. Use sufficient setting mortar so a slight excess will be forced out the edges of masonry units as they are set. Press units firmly into place in soft mortar bed, wiggle and apply slight pressure to unit to ensure firm bonding, completely filling space between units and scratch coat and causing mortar to extrude slightly around edges of units. Ensure that mortar covers 100% of the back of the masonry unit.
- D. Bond Pattern for Thin-Brick Masonry: Unless otherwise indicated, lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions. Used formed corner units at corners or jambs.
 - 1. As indicated on Drawings
- E. Maintain uniform joint widths except for variations due to different masonry sizes and where minor variations are required to maintain bond alignment, if any. Lay walls with joints not less than 1/2 inch at narrowest points nor more than 3/4-inch at widest point.
- F. Rake out joints for pointing with mortar to depth of not less than 1/2 inch (13 mm) before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

3.5 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- B. Variation from Level: For bed joints and lines of exposed horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- C. Measure variation from level, plumb, and position shown in plan as a variation of the average plane of each stone face from level, plumb, or dimensioned plane.
- D. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.

3.6 POINTING

- A. Prepare masonry-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch deep until a uniform depth is formed.

- B. Point masonry joints by placing and compacting pointing mortar in layers of not more than 3/8 inch deep. Compact each layer thoroughly and allow to it become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
 - 1. Joint Profile: As indicated.

3.7 ADJUSTING AND CLEANING

- A. Remove and replace masonry of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged masonry. Masonry may be repaired if methods and results are approved by Architect.
 - 2. Defective joints.
 - 3. Masonry not matching approved samples and mockups.
 - 4. Masonry not complying with other requirements indicated.
- B. Replace in a manner that results in masonry matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean masonry as work progresses. Remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Protect adjacent masonry and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 - 3. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
 - 4. Clean masonry veneer assemblies by bucket and brush hand-cleaning method described in BIA Technical Note No. 20, Revised II, using job-mixed detergent solution.

3.8 EXCESS MATERIALS AND WASTE

- A. Excess Masonry: Stack excess masonry where directed by Owner for Owner's use.
- B. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than 4 inches in greatest dimension.
 - 2. Mix masonry waste with at least 2 parts of specified fill material for each part of masonry waste. Fill material is specified in Section 31 20 00 "Earth Moving."

- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes labor, materials, services, equipment, and appliances required in conjunction with or related to the furnishing, fabrication, delivery, and erection of all structural steel, as defined below. Include all supplementary parts, members, and connections necessary to complete the structural steel work, regardless of whether all such items specifically are shown or specified on the drawings. Miscellaneous metal fabrications, architecturally exposed structural steel, metal stairs and ladders, cold-formed metal framing, and steel deck are specified in other Division 05 sections.
- B. Related Requirements:
1. Specification 01 45 29 "Structural Testing and Inspections" for testing and inspection requirements associated with structural steel.
 2. Specification 01 81 13 "Sustainable Design Requirements" for sustainable design requirements.
 3. Section 05 12 13 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
 4. Section 05 12 20 "Straight Beam Ultrasonic Examination" for requirements for testing of certain steel elements.
 5. Specification 09 91 00 "Painting" and 09 96 00 "High-Performance Coatings" for surface preparation and priming requirements.

1.3 REFERENCES

- A. Definitions:
1. Erection Drawings: Field installation or member-placement drawings that are prepared by the Fabricator to show the location and attachment of the individual shipping pieces.
 2. Erection-Bracing Drawings: Drawings that are prepared by the Erector to illustrate the sequence of erection, any requirements for temporary supports, and the requirements for raising, bolting, and or/welding. These drawings are in addition to and separate from the Erection Drawings.

3. Heavy Trusses: A steel truss composed of wide flange members with a span greater than 150'-0".
4. Heavy Shapes and Plates:
 - a. Heavy Shapes:
 - 1) ASTM A6 structural shapes with a flange thickness greater than 2 inches.
 - 2) ASTM A6 structural shapes with a flange thickness equal to or greater than 1½ inches used in the Seismic Force Resisting System.
 - b. Heavy Plates: Plates with thickness equal to or greater than 2 inches.
5. Long-span Steel: Custom-fabricated steel with spans that are greater than 100 feet.
6. Professional Engineer: A professional engineer who is licensed to practice engineering in the state where the project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material.
7. Shop Drawings: Drawings of the individual structural steel shipping pieces that are to be produced in the fabrication shop.
8. Structural Steel: Structural steel shall be defined as that work prescribed in Section 2.1 of AISC 303 and all steel support for elevator guide rails and catwalks (including support members and attached structural steel shapes and plates such as hangers, toe plates, and the grating or checkered plate walking surface).

B. Reference Standards:

1. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified.
 - a. All federal (OSHA), state, and local laws that govern safety requirements for steel erection and other requirements if more stringent than the codes and standards enumerated below. OSHA requirements include regulation 29 CFR 1926, Part R, "Safety Standard for Steel Erection".
 - b. AASHTO, "LRFD Bridge Design Specifications", U.S. Customary Units.
 - c. AASHTO, "LRFD Bridge Construction Specifications."
 - d. AISC, "Steel Construction Manual."
 - e. AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," except as noted herein.
 - 1) Certain sections in this specification contain requirements that are more restrictive and/or different than contained in this standard. In such cases, the requirements of this specification shall control.
 - f. ANSI/AISC 360, "Specification for Structural Steel Buildings."
 - g. ANSI/AWS D1.1, "Structural Welding Code – Steel."
 - h. ANSI/AWS D1.3, "Structural Welding Code – Sheet Steel."

- i. ANSI/AWS D1.4, "Structural Welding Code – Reinforcing Steel."
- j. Research Council on Structural Connections (RCSC), "Specification for Structural Joints using High-Strength Bolts."
- k. The Society of Protective Coatings, "SSPC Painting Manual", Volumes 1 and 2.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Quality Control:

- a. The Contractor is responsible for quality control, including workmanship and materials furnished by his subcontractors and suppliers.
- b. The Contractor shall coordinate the fabrication and erection of all structural steel work with the work of other trades.
- c. The Fabricator alone shall be responsible for all errors of detailing, fabrication, and for the correct fitting of the structural members.
- d. The Fabricator shall coordinate connection details, joint fit-up procedures, and field adjustment requirements with Erector. The Contractor shall coordinate provision of all erection bolts, lifting lugs, or other devices required for erection with the Fabricator and the Erector and for interference with architectural finishes and constraints.

2. Document Conflict and Precedence:

- a. In case of conflict among documents, including architectural and structural drawings and specifications, notify Architect/Engineer prior to submitting proposal. In case of conflict between and/or among the structural drawings and specifications, the strictest interpretation shall govern, unless specified otherwise in writing by the Architect/Engineer.
- b. Questions about Contract Documents: The Contractor shall notify promptly the Architect/Engineer whenever design of members and connections for any portion of the structure are not indicated clearly or when other questions exist about the Contract Documents. Such questions shall be resolved prior to the submission of shop drawings.

3. Materials and installed work may require testing and retesting, as directed by the governing building code or the Architect/Engineer, at any time during progress of work.

- a. The Contractor shall provide adequate notification to the Owner's Testing Agency of construction operation including the project schedule to allow the Testing Agency to schedule inspections. Failure to notify sufficiently may result in additional costs incurred by the Testing Laboratory that may be back-charge to the Contractor by the Owner.
- b. The Contractor shall cooperate with laboratory personnel, provide access to the work, and provide access to manufacturer's operations.
- c. The Contractor shall cooperate with the Owner's Testing Laboratory when Arbitration Testing and Inspection is called for due to a disagreement regarding the tension in installed bolts that have been

inspected according to the Structural Testing and Inspections specification.

- d. The Contractor shall make adequate arrangement with the Owner's Testing Agency for inspection of material stockpiles and facilities.
- e. The Contractor shall provide to the laboratory certificates and representative samples of materials proposed for use in the work in quantities sufficient for accurate testing as specified.
- f. The Contractor shall furnish labor, equipment, and facilities as required for sampling and testing by the laboratory and other facilitates the required inspections and test.
- g. Inspection or testing by the Owner does not relieve the Contractor of his responsibility to perform the Work in accordance with the Contract Documents. Test not specifically indicated to be done at the Owner's expense, including retesting of rejected materials and installed work, shall be done at the Contractor's expense. See the Structural Testing and Inspections Specification.

B. Preinstallation Meetings:

1. At least 14 days prior to beginning structural steel erection, the Contractor shall hold a meeting to review the detailed quality control and construction requirements and to determine the procedures for producing proper structural steel construction. Also, review requirements for submittals, status of coordinated work, and availability of materials. Establish work progress schedule and procedures for materials inspection, testing, and certification.
2. The Contractor shall require responsible representatives of every party who is concerned with the structural steel work to attend the conference, including, but not limited to, the following:
 - a. Contractor's Superintendent.
 - b. Laboratory responsible for field quality control.
 - c. Special Inspector or Laboratory responsible for shop inspection or testing.
 - d. Structural steel detailer.
 - e. Structural steel fabricator.
 - f. Structural steel erector.
 - g. Owner's and Architect's Representative.
 - h. Engineer.
3. Minutes of the meeting shall be record, typed, and printed by the contractor and distributed to all parties concerned within five days of the meeting. One copy of the minutes shall be transmitted to the following for information purposes:
 - a. Owner's Representative.
 - b. Architect.
 - c. Engineer.
4. The Engineer shall be present at the conference. The Contractor shall notify the Engineer at least seven days prior to the scheduled date of the conference.

- C. Alternates: Substitutions for the member sizes, type(s) of steel connection details, or any other modifications proposed will be considered by the Architect/Engineer only under the following conditions:
1. The request has been made and accepted prior to the submission of shop drawings. All substitutions shall be marked clearly and indicated on the shop drawings as a substitute.
 2. There is a substantial cost advantage or time advantage to the Owner or that the proposed revision is necessary to obtain the required materials or methods at the proper times to accomplish the work in the time scheduled.
 3. Sufficient sketches, engineering calculations, and other data have been submitted to facilitate checking by the Architect/Engineer, including cost reductions or savings in time to complete the work.
 4. In no case shall such substitutions result in additional cost to the Owner.

1.5 SUBMITTALS

- A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for following products to show compliance with specifications, including the specified standards):
1. Shrinkage-Resistant Grout.
 2. Welding Electrodes.
 3. Structural Steel Primer Paint.
 4. Inorganic or Other Protective Paint.
 5. Shear Studs.
 6. Direct Tension Indicators.
 7. Bearing pads.
 8. Slide bearings.
- B. Shop Drawings:
1. Preliminary Connection Review: Submit preliminary details of proposed connections not less than 14 days in advance of the start of preparation of detailed shop drawings. Proposed variations from the details shown on the drawings will be considered and such variations must have preliminary approval from the Engineer prior to the preparation of detailed shop drawings. Failure to adhere to the requirements of this paragraph obligates the Contractor to take responsibility for any and all resulting delays in the detailing and fabrication of structural steel.
 2. Detailed Shop Drawings: Submit drawings showing complete details and schedules for fabrication and assembly of structural steel members. Drawings shall include the following minimum information:
 - a. Details of cuts, connections, camber, holes, and other pertinent data.
 - b. Indication of welds by standard AWS symbols, and show size, length, and type of each weld.
 - c. Indication of type, size, and length of bolts, distinguishing between shop and field bolts. Identify the type of high-strength bolted connection (slip-critical, direct-tension, or bearing connections). Indicate locations of pretensioned bolts.
 - d. Connection material specification and sizes.

- e. Joints or groups of joints in which a specific assembly order, welding sequence, welding technique, or other special precautions are required.
 - f. Holes, flange cuts, slots, and openings shall be made as required by the structural drawings, all of which shall be properly located by means of templates.
 - g. Setting drawings, templates, and directions for installation of anchor rods and other anchorages to be installed by others.
 - h. Non-Destructive Testing (NDT) to be performed by the Fabricator, if any.
 - i. A letter sealed by the Fabricator's Professional Engineer responsible for the design of any of the connections shown on the shop drawings attesting that the engineer has reviewed the shop drawings and that the connections detailed and shown on the shop drawings conform to the engineer's design.
3. Erection Drawings: Submit complete erection drawings showing field installation and member-placing instructions for locating and attaching the individual shipping pieces.
 4. Erection-Bracing Drawings: Submit, for record purposes only, complete erection-bracing drawings.
 5. Shear Connector Placement Drawings: Provide drawings showing proper placement (longitudinal and transverse spacing) of shear connectors on each composite beam requiring such connectors. The drawings shall show the proper relationship of the shear connectors to the flutes in the steel deck and the arrangement of shear connectors along the span of the composite beam. Show the method of attachment of shear connectors and the proposed brand and model of equipment to be used.
 6. All drawings submitted for review shall have blank space for a 2" high and 3.5" wide shop drawing stamp of the Engineer as part of the title block
- C. Certificates:
1. Structural Steel: Submit for each type.
 2. High-Strength Bolts: Submit for each type, including nuts and washers.
 3. Unfinished Bolts and Nuts.
 4. Bearing Pads.
 5. Slide Bearings.
 6. Pot Bearings: Submit certificates for steel, PTFE, and neoprene.
- D. Delegated Design Submittals:
1. Preliminary Connection Design Review: In conjunction with the Preliminary Connection Review submittal, the Fabricator's licensed professional engineer shall submit example design calculations for each connection type not less than 14 days in advance of the start of preparation of detailed shop drawings.
 2. Connection Design Submittals: The Fabricator's licensed professional engineer shall submit complete design calculations show all information as specified in the "Connections" section under Part 2. The Engineer reserves the right to reject all shop drawings submitted without complete design calculations.
 3. Connection Design Validation Letter: The Fabricator's licensed professional engineer responsible for the design of any of the connections shown on the shop drawings shall submit a letter that is sealed attesting that the

connection design engineer has reviewed the shop drawings and that the connections detailed and shown on the shop drawings conform to the engineer's design.

4. Long-Span Steel Erection Design Submittals: Submit calculations and drawings, prepared under the supervision of the Erector's licensed professional engineer, for the final erection procedure.
- E. Test and Evaluations Reports: Submit certified reports of tests required by this Specification. Include data on type(s) of tests conducted and test results.
- F. Field Quality Control Submittals:
 1. Surveys: Submit for each survey required.
- G. Sustainable Design Submittals:
 1. Recycled Content – **Credit MR 4.1/MR 4.2:** Provide documentation indicating percentage of post-consumer and pre-consumer recycled content by weight per unit of product or assembly containing the product. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.
 2. Material Proximity – **Credit MR 5.1/MR 5.2:** When the distance to the project site is 500 miles or less, indicate location and distance to project site of extraction, harvesting, recovery and manufacturing of all materials. Indicate the dollar value of the material cost of the product containing local/regional materials. Where product components are sourced or manufactured in separate locations, provide location and percentage by weight of each component per unit of product.
- H. Environmental Product Declarations:
 1. To encourage the use of building products that are working to minimize their environmental and health impacts, consideration will be given to products with publicly available Environmental Product Declarations. For all structural steel submit one of the following that applies to the product:
 - a. Product-specific Type III EPD with internal or external review that conform to ISO 14025, and EN 15804 or ISO 21930 and has at least a cradle to gate scope.
 - b. Industry Wide Type III EPD in which the manufacturer is explicitly recognized as a participant by the program operator. EPD shall conform to ISO 14025, and EN 15804 or ISO 21930 and has at least a cradle to gate scope.
 - c. A letter from the product manufacturer, on manufacturer's letterhead, stating that the product does not have a product specific EPD nor was a participant in an industry wide EPD.
- I. Special Procedure Submittals:
 1. Long-Span Steel Erection Procedure: Submit a written, detailed erection procedure for the long-span steel system that has been reviewed and approved by the General Contractor, Fabricator, Steel Erector, and the

Erector's licensed professional engineer. Procedure shall be sealed by the Erector's engineer.

J. Qualification Statements:

1. Submit qualification data, including required certifications, for firms and persons specified in the "Qualifications" section under Part 1, to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
2. Submit a resume from the structural steel detailer showing a minimum of two years of experience selecting or completing structural steel connection details using information found in tables in the AISC "Steel Construction Manual".
3. Submit Welding Procedure Specifications (WPS) in accordance with ANSI/AWS D1.1 for all welded joints. Submit test reports showing successful passage of qualification tests for all non-prequalified WPSs.
4. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests as specified in the "Qualifications" section under Part 1. If recertification of welders is required, retesting will be at Contractor's responsibility.

K. Minutes of Preinstallation Meeting: Submit for review.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Fabricator:

- a. The structural steel fabricator shall have not less than 10 years of experience in the successful fabrication of structural steel including not less than three projects using heavy trusses.
- b. The structural steel fabricator must participate in the AISC Quality Certification Program and be designated an AISC Certified Plant in Category STD, Standard for Steel Building Structures.

2. Detailer:

- a. The structural steel detailer shall have not less than five years of experience in the successful detailing of structural steel similar to this project including experience in selecting or completing structural steel connection details using information found in tables in the AISC "Steel Construction Manual".
- b. The structural steel detailer firm shall be certified under the Quality Procedures Program of the National Institute of Steel Detailing. The project shall be detailed by qualified structural steel detailers who are either personally certified under the National Institute of Steel Detailing as a Class I or Class II Detailer in the Structural/Miscellaneous discipline or are supervised by a detailer certified as a Class I Senior Detailer in the Structural/Miscellaneous discipline.

3. Erector:

- a. The structural steel erector shall have not less than five years of successful experience in the erection of structural steel of a similar nature to this project.
 - b. The structural steel erector must participate in the AISC Erector Certification Program and be designated an AISC Advanced Certified Steel Erector.
 - c. The structural steel erector shall have not less than five years of successful experience in the erection of structural steel including not less than three projects using heavy trusses.
4. Welding Qualifications: Qualify welding processes and welding operators in accordance with AWS "Structural Welding Code – Steel".
 5. Professional Engineer:
 - a. The Professional Engineer employed by the Fabricator for connection design shall be experienced in the specific area of structural steel connection design with demonstrated experience of not less than three projects of similar scope and complexity.
 - b. The Professional Engineer employed by the Erector for preparation of Erection Bracing Drawings shall be experienced in the specific area of structural frame bracing during erection design with demonstrated experience of not less than three projects of similar scope and complexity.
 6. Specialty Welding Consultant: The welding consultant employed by the Fabricator shall be a licensed Professional Engineer registered in the state where the project is located and shall have a minimum of five years of experience in weld engineering.
 7. Independent Testing Laboratory:
 - a. Any testing laboratory retained to perform tests that are required by this specification shall meet the basic requirements of ASTM E 329 and shall submit to the Owner, Architect, and Engineer evidence of current accreditation from the American Association for Laboratory Accreditation, the AASTHO Accreditation Program or the "NIST" National Voluntary Laboratory Accreditation Program.
 - b. The Testing Laboratory shall be an Approved Agency by the Building Official to perform Special Inspections and other tests and inspections as outlined in the applicable building code.
 - c. Tests and inspections shall be conducted in accordance with specified requirements, and if not specified, in accordance with the applicable standards of the American Society for Testing and Materials or other recognized and accepted authorities in the field.
 - d. Qualification of Welding Inspectors:
 - 1) Inspectors performing visual weld inspection shall meet the requirements of AWS D1.1 Section 6.1.4. Inspectors shall have current certification as an AWS Certified Welding Inspector (CWI). Assistant inspectors, if any, shall be supervised by an Inspector and shall be qualified by training and experience to perform the specific functions to which they are assigned.

- 2) Inspectors performing nondestructive examinations of welds other than visual inspection (MT, PT, UT, and RT) shall meet the requirements of AWS D1.1, Section 6.14.6.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.
- B. Deliver anchor rods and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time so as not to delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration. Do not store materials on structure in a manner that might exceed allowable loads on or cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed by Architect/Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Structural Steel:
 1. All hot rolled steel plates, shapes, sheet piling, and bars shall be new steel conforming to ASTM A 6.
 2. Comply with the provisions of the following ASTM Specifications as appropriate for the grades and types, and at the locations as specified on the drawings:
 - a. Structural Steel Wide Flange and WT Shapes: High Strength Steel, ASTM A 992.
 - b. M-Shapes, S-Shapes, and Channels: Carbon Steel, ASTM A 36.
 - c. Angle Shapes: Carbon Steel, ASTM A 36.
 - d. Structural Steel Plates and Bars: Carbon Steel, ASTM A 36.
 - e. Structural Steel Plates and Bars: High Strength Steel, ASTM A 572, Grade 50.
 - f. Steel Pipe: ASTM A 53 (Type E or S) Grade B (Fy = 35 ksi).
 - g. Round HSS: ASTM A 500, Grade C (Fy = 46 ksi).
 - h. Square and Rectangular HSS: ASTM A 500, Grade C (Fy = 50 ksi).
 3. Requirements for Heavy Shapes and Heavy Plates in Welded Connections. Heavy Shapes and Heavy Plates shall have a Charpy V-Notch toughness of 20 ft-lb or greater at 70 F, established by testing. The impact test shall comply with ASTM A 673, Frequency P.
 - a. Heavy Shapes shall be supplied with Charpy V-Notch impact test results in accordance with ASTM A 6, Supplementary Requirement S30, "Charpy V-Notch Impact Test for Structural Shapes: Alternate Core Location."

- b. Heavy Plates shall be supplied with Charpy V-Notch impact test results in accordance with ASTM A 6, Supplementary Requirement S5, "Charpy V-Notch Impact Test".
Exception: This requirement does not apply to columns that are not part of the Seismic Force Resisting System and are not part of a braced frame or a moment frame.
 - 4. Connection Material: Unless noted otherwise on the drawings, column stiffener plates and doubler plates at moment connections shall be the same grade of steel as the beam connecting the column (highest grade if more than one grade is used). All other connection material except as noted otherwise on the drawings including bearing plates, gusset plates, stiffener plates, filler plates, angles, etc. shall be A36 steel unless a higher or matching grade of steel with the members connected is required by strength or stiffness calculations and provided the resulting sizes are compatible with the members connected.
 - 5. Structural Steel Surfaces: For fabrication of work which will be exposed to view in the completed structure, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
- B. Structural Bolts and Threaded Fasteners: Structural bolts and threaded fasteners shall comply with the following ASTM Specifications as appropriate for the types and at the locations as specified on the drawings:
- 1. ASTM F 3125 Grade A325 Type 1.
 - 2. ASTM F 3125 Grade A490 Type 1.
 - 3. ASTM A 449 Type 1 to be used only for bearing type connections with a bolt diameter greater than 1 1/2".
 - 4. Twist-Off-Type Tension-Control Bolt Assemblies:
 - a. Bolts that are manufactured to conform to ASTM F 3125 Grade F1852.
 - b. Bolts that are manufactured to conform to ASTM F 3125 Grade F2280.
 - c. Subject to conformance with specified requirements, acceptable manufacturers include but are not limited to:
 - 1) Nucor Fastener, A Division of Nucor Corporation.
 - 2) Lake Erie Screw Corp.
 - 3) Vermont Fasteners Manufacturing.
 - 4) Lohr Structural Fasteners.
 - 5. Threaded Round Stock:
 - a. ASTM A 36.
 - b. ASTM A 572 Grade 50 (to 2 inches in diameter).
 - c. ASTM A 572 Grade 42 (greater than 2 inches and up to six inches in diameter).
 - d. ASTM A 588 (corrosion resistant).
 - e. ASTM A 354 Grade BD, 130 ksi (to 2 1/2 inches in diameter).
 - f. ASTM A 354 Grade BD, 115 ksi (greater than 2 1/2 inches to 4 inches in diameter).

- g. ASTM A 354 Grade BC, 109 ksi (to 2 ½ inches in diameter).
 - h. ASTM A 354 Grade BC, 99 ksi (greater than 2 ½ inches to 4 inches in diameter).
- 6. Bolts and Nuts, High Strength Bolts: Bolts and nuts for all high strength bolts shall be heavy hex head conforming to ANSI Standards B18.2.1 and B18.2.2 respectively. Nuts shall conform to ASTM A 563.
 - 7. Washers: All washers shall be circular, flat and smooth and shall conform to the requirements of Type A washers in ANSI Standard B23.1. Washers for high strength bolts shall be hardened and conform to ASTM F 436. Beveled washers for American Standard Beams and channels shall be square or rectangular, shall taper in thickness (16 2/3% slope) with an average thickness of 5/16". When an outer face of a bolted part has a slope greater than 1:20 with respect to a plane normal to the bolt axis, a beveled washer shall be used. Washers to be used with A490 bolts larger than 1 inch in diameter and installed over oversized or short-slotted holes and other similar situations shall conform to ASTM F 436 except with 5/16 inch minimum thickness.
 - 8. Zinc-Coated Bolts: ASTM F 3125 Grade A325 bolts, with their nuts and washers, that are used to connect steel called for on the drawings or in the specifications as hot-dip galvanized after fabrication shall be zinc-coated either by the hot-dip process in accordance with ASTM A 153, Class C or by the mechanical deposition process in accordance with ASTM B 695, Class 50, Type 1. The bolts, nuts, and washers shall all be zinc-coated using the same process and they shall be considered together as an assembly and shall be tested and shipped together as such. Comply with all the requirements of ASTM F 3125 Grade A325 and ASTM A 563 as they relate to zinc-coated materials. ASTM F 1852 bolts with their nuts, and washers shall be zinc-coated only by the mechanical deposition process in accordance with ASTM B 695, Class 50, Type 1. Do not zinc-coat ASTM F 3125 Grade A490 bolts.
 - 9. Atmospheric Corrosion Resistant Bolts: High strength bolts, nuts and washers connecting steel specified as ASTM A 588 or A242 weathering steel shall be weather resistant Type 3 bolts and similarly treated nuts and washers.
 - 10. Direct Tension Indicators: Compressible washer-type direct-tension indicators conforming to ASTM F 959.
 - a. Subject to conformance with specified requirements, acceptable manufacturers include but are not limited to:
 - 1) Applied Bolting Technology.
 - 2) Turnasure, LLC.
 - 11. Bolt Lubrication: All bolts shall be well lubricated at time of installation. Dry, rusty bolts will not be allowed.
 - 12. New Bolts: All bolts shall be new and shall not be reused.
- C. Electrodes for Welding:
- 1. Provide electrodes that comply with AWS D1.1, "Structural Welding Code - Steel" and that can produce welds that have a minimum Charpy V-notch toughness of 20 ft-lbs at 40° F, unless noted otherwise in these specifications or on the drawings.
 - 2. Electrodes for various welding processes shall be as specified below:

- a. SMAW:
 - 1) E70XX low hydrogen.
 - 2) E80XX for Grade 60 and 65 steel with complete joint penetration (CJP) welds or as indicated on the drawings.
 - b. SAW:
 - 1) F7X-EXXX.
 - 2) E8X-EXX-XX for Grade 60 and 65 steel with complete joint penetration (CJP) welds or as indicated on the drawings.
 - c. GMAW:
 - 1) ER70S-X.
 - 2) ER80S-X for Grade 60 and 65 steel with complete joint penetration (CJP) welds or as indicated on the drawings.
 - d. FCAW:
 - 1) E7XT-X.
 - 2) E8XT-X for Grade 60 and 65 steel with complete joint penetration (CJP) welds or as indicated on the drawings.
3. Electrodes shall be compatible with parent metal joined.
- D. Headed Studs used as Anchors for Structural Steel Plates and Members connecting to Concrete: AWS Type A studs manufactured in conformance with ASTM A 29 with a minimum tensile strength of 61,000 psi of sizes as specified on the drawings.
- E. Headed Studs used as Composite Member Shear Connectors: AWS type B studs manufactured in conformance with ASTM A 29 with a minimum tensile strength of 65,000 psi of sizes as specified on the drawings.
- F. Deformed Bar Anchors: 3/8" to 5/8" diameter AWS Type C studs manufactured in conformance with ASTM A 1064 with a minimum yield strength of 70,000 psi and a tensile strength of 80,000 PSI. 3/4" or larger diameter, ASTM A 706 bars of equal size with welds to steel substrate that develop the full strength of the anchor. ASTM A 615 reinforcing bars may not be substituted for deformed bar anchors. Reinforcement shall be approved by the ICC-Evaluation Service, Inc and shall have the Evaluation Service Report submitted for Engineer review. The following are acceptable products, provided that their Evaluation Service Reports are still valid at the time of intended use on the project:
- a. Nelson Stud Welding, Inc.; Nelson D2L Deformed Bar Anchor Studs (ESR-2907).
 - b. Tru-Weld Division, TFP Corporation; Deformed Bar Anchors (ESR-2823).
- G. Steel Forgings: ASTM A 668, Class A.
- H. Steel Forgings: ASTM A 668, Class B. Ultimate strength design capacity shall meet or exceed requirements shown on the drawings.

- I. Steel Castings: ASTM A 27, Grade 65-35, medium strength carbon steel.
- J. Anchor Rods:
 - 1. All anchor rods shall conform to ASTM F 1554. unless noted otherwise on the drawings and shall be of the yield strength as specified below as appropriate for the types and at the locations as specified on the drawings:
 - a. Grade 55 (1/4 inch to 4 inches in diameter), complying with Supplementary Requirement S1 of ASTM F 1554.
 - b. Grade 36, (1/4 inch to 4 inches in diameter).
 - c. Grade 105 (1/4 inch to 3 inches in diameter).
 - 2. Anchor rods used with galvanized baseplates shall be galvanized.
 - 3. Nuts: All nuts with anchor rods shall be heavy hex head conforming to ASTM A 563.
 - 4. Washers: Unless indicated otherwise, washers for all base plates shall be in accordance with the AISC "Steel Construction Manual", Table 14-2 with holes 1/16" larger than the anchor rod diameter. Washers shall conform to ASTM A 36 steel.
- K. Structural Steel Primer Paint:
 - 1. Primer paint shall produce a Class B coating on all painted faying surfaces that are a part of a slip-critical connection as noted on the drawings; surface prepared according to SSPC-SP-6 (Commercial Blast Cleaning) and shall be of the following types.
 - a. Organic zinc-rich primer utilizing either an epoxy or urethane binder with a minimum volume solids ratio of 50 percent with a minimum zinc content of 80 percent by weight in the dry film. Apply primer at a rate to achieve a dry film thickness of 3.0 to 4.0 mils. The primer shall comply with the AISC Class B slip critical requirement. (SSPC-SP6 Commercial Blast Cleaning).
 - b. Ethyl Silicate Inorganic zinc-rich primer with a minimum volume solids ratio of 60 percent and with a minimum zinc content of 75 percent by weight in the dry film. The primer shall comply with the AISC Class B slip critical requirement. (SSPC-SP6 Commercial Blast Cleaning).
 - 2. Unless noted otherwise, primer paint shall be one of the following types with the indicated surface preparation:
 - a. Zinc oxide, raw linseed oil and alkyd primer, surface prepared according to SSPC-SP-2 (Hand Tool Cleaning) unless noted otherwise in this specification.
 - b. SSPC-Paint 23 acrylic primer, surface prepared according to SSPC-SP-6 (Commercial Blast Cleaning).
 - 3. Refer to Architect's drawings and specifications for final paint finish requirements of structural steel. Primer paint shall be compatible with final paint requirements.

- L. Non-Shrink Grout: Provide grout type(s) as specified on the drawings:
1. Non-Metallic Non-Shrink Grout: Premixed, non-corrosive, non-staining product containing Portland cement, silica sands, shrinkage compensating agents, and fluidity improving compounds. Conform to ASTM C 1107. Provide the minimum strength as shown below as determined by grout cube test at 28 days:
 - a. 6,000 PSI for supporting concrete 3,000 PSI and less.
 - b. Unless noted otherwise on the drawings, grout strength for supporting concrete greater than 4,000 PSI shall be 8,000 PSI.

Subject to conformance with specified requirements, acceptable non-shrink grouts include:

 - c. L&M Construction Chemicals, Inc.; Crystex and Duragrout.
 - d. Dayton-Superior Corporation; Sure Grip High Performance Grout and 1107 Advantage Grout.
 - e. BASF Construction Chemicals; Masterflow 555 and Set Grout.
 - f. U.S. Grout Corp.; Five Star Grout.
 - g. The Euclid Chemical Company; NS Grout.
 - h. Hilti, Inc.; CG 200 PC.
 2. High Flow, Non-Metallic Grout: Use high-flow grout where high fluidity and/or increased placing time is required and for base plates that are larger than 10 square feet. The factory pre-mixed grout shall conform to ASTM C 1107, "Standard Specification for Packages Dry, Hydraulic-Cement Grout (Non-Shrink)." In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95% bearing under an 18" x 36" base plate. Provide one of the following:
 - a. The Euclid Chemical Co.; Hi-Flow Grout.
 - b. BASF Construction Chemicals; Masterflow 928.
 3. Epoxy Grout: A three-part grout system consisting of a blend of epoxy resin, curing agent and specialty aggregates conforming to Corps of Engineers CRD-590.
 - a. Subject to conformance with specified requirements, acceptable products include:
 - 1) L&M Construction Chemicals, Inc.; Epogrout 758.
 - 2) The Euclid Chemical Company; E³-G, E³-F and E³-HP.
 - 3) Dayton-Superior Corporation; Sure-Grip High-Flow Epoxy Grout.
 - 4) BASF Construction Chemicals; Masterflow 648 CP and Masterflow MP.
- M. Grating: Welded steel bar grating of the type, depth, and finish noted on the drawings capable of carrying not less than the stated live load and deflecting not more than span/360 under that load.
- N. Checkered Plate: ASTM A 793.

O. Hot-Dip Galvanizing:

1. Scope: All structural steel items and their connections permanently exposed to exterior conditions or that are within areas of unconditioned airspace, whether specified on the drawings or not, shall be hot-dip galvanized after fabrication unless indicated on the drawings or in Specification 099100 to receive a primer and/or finish coat. Such items include, but are not limited to:
 - a. Base plates and anchor rods supporting galvanized members.
 - b. Shelf angles.
 - c. Parapet wall supporting members.
 - d. Screen wall supporting members.
 - e. Window washing support members.
 - f. Exterior covered walkways.
 - g. Embedded plates in concrete exposed to unconditioned airspace.
 - h. Garage guardrail steel and connections.
 - i. Cooling tower support steel.
 - j. Building skin support steel exposed to moisture outside the exterior waterproofing surface.
 - k. Examine the architectural and structural drawings for other items required to be hot-dip galvanized.
2. Zinc-coat all ASTM F 3125 Grade A325 bolts nuts, and washers used in the connection of such steel. Field welded connections shall have welds protected and the exposed portions of ASTM F3125 Grade A490 bolts, nuts, and washers shall be protected with galvanizing repair paint.
3. Surface Preparation: All steel to be hot-dip galvanized shall undergo the following surface preparation as specified by the Society for Protective Coatings (SSPC), Volume 2.
 - a. Remove all grease, oil, grime and foreign contaminants by thorough cleaning with an alkaline or organic solvent followed by thorough rinsing in cold water.
 - b. Remove scale by pickling in diluted sulfuric or hydrochloric acid. Pickling shall be followed by a rinse in warm water and a second rinse in cold water. As an alternative to pickling, the steel may be white metal blast cleaned according to SSPC-SP-5.
 - c. Dip in a flux solution of zinc ammonia chloride followed by drying at room temperature.
4. Zinc Coating: The zinc coating for steel shapes and plates shall conform to ASTM A 123. Weight of zinc coating per square foot of surface for 1/8 inch and 3/16 inch thick steels shall average not less than 3.0 mils with no individual thickness less than 2.6 mils. The coating weight shall average not less than 3.9 mils for 1/4" thick and heavier steel with no individual thickness less than 3.3 mils.

- P. Galvanizing Repair Paint: Galvanizing repair paint shall be "ZRC Cold Galvanizing Compound" as manufactured by ZRC Chemical Products or a paint complying with SSPC-Paint 20, Level 1.

- Q. Frictionless Bearing Pads: Provide frictionless bearing pads at all beam or slab elements where expansion joints are indicated and only a single support is provided.
1. Types:
 - a. Frictionless bearing pads shall be a nominal 3/32" glass filled virgin Tetrafluoroethylene (TFE) conforming to ASTM D 4745 with a 10 gauge A36 steel backing plate factory bonded with a tested epoxy performed in a heated bonding process under a controlled pressure. Provide one sliding pad tack welded to the lower supporting surface and one tack welded to the upper surface. Unless detailed otherwise on the drawings, the upper element shall be larger than the lower element on all sides by the amount of the expansion joint width shown on the drawings.
 - b. The lower frictionless bearing pads shall be a nominal 1/16" glass filled virgin Tetrafluoroethylene (TFE) conforming to ASTM D 4745 with a 10 gauge A36 steel backing plate factory bonded with a tested epoxy performed in a heated bonding process under a controlled pressure. The upper frictionless bearing pad shall be a 20 gauge stainless steel sheet (RMS < 20) resistance welded to a 10 gauge A36 steel backing plate. The lower sliding pad shall be tack welded to the lower supporting surface and the upper pad tack welded to the upper surface. Unless detailed otherwise on the drawings, the upper element shall be larger than the lower element on all sides by the amount of the expansion joint width shown on the drawings.
 2. Design: The pad size and design shall conform to AASHTO "LRFD Bridge Design Specifications", Section 14. Design bearing pressure under total service load shall not exceed the manufacturer's recommendation. If neoprene is used the compressive load shall be limited to 800 PSI.
 3. Corrosion Resistance: Frictionless bearing pads for exterior or exposed usage shall be manufactured for use in an exposed climate of heat, cold, moisture, and ultraviolet rays. All backing steel in an exposed or open environment shall be shop painted with a zinc rich paint or field painted with "ZRC Cold Galvanizing Compound".
 4. Acceptable Manufacturers: The following manufacturers are acceptable:
 - a. Con-Serv, Inc.
 - b. Seismic Energy Products, L.P.
- Other manufacturers will be acceptable only with Engineer approval prior to bid.
- R. Elastomeric Bearing Pads:
1. Type: All bearing pads shall be AASHTO grade chloroprene pads manufactured from 100 percent chloroprene (neoprene) as the only elastomer. The pads shall conform to the requirements of the AASHTO "LRFD Bridge Construction Specifications", Section 18. Provide pads with a durometer Shore A hardness of sixty plus or minus five.
 2. Design: The design of all bearing pads shall conform to the AASHTO "LRFD Bridge Design Specifications", Section 14.

3. Beveled Bearing Pads: Provide beveled bearing pads between non-parallel load surfaces.
4. Manufacturers: Acceptable manufacturers are listed below:
 - a. Con-Serv Inc., Georgetown, S.C.
 - b. Seismic Energy Products, L.P., Athens, TX.

Other manufacturers will be acceptable only with Engineer approval prior to bid.

2.2 FABRICATION

- A. Structural steel members for which shop drawings have not been reviewed shall not be fabricated. Any steel detailed or fabricated prior to the Initial Survey from Part 3 below is at contractor's risk.
- B. All fabricated material and connections shall fit within architectural constraints.
- C. The omission from the shop drawings of any materials required by the Contract Documents shall not relieve the Contractor of the responsibility of furnishing and installing such materials, even though the shop drawings may have been reviewed.
- D. Shop Fabrication and Assembly:
 1. Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specification and as indicated on approved final shop drawings. Provide camber in structural members where indicated.
 2. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
 3. Milled surfaces of built-up sections shall be completely assembled or welded before milling.
 4. Fitted stiffeners shall be fabricated neatly between flanges, and the ends of stiffeners shall be milled or ground to secure an even bearing against abutting surfaces. All milled or ground joints shall bear throughout their contact length.
- E. Dimensional Tolerances: Dimensional tolerances of fabricated structural steel shall conform to Section 6.4 of the AISC Code of Standard Practice.
- F. Camber:
 1. Camber of structural steel members and trusses is indicated on the drawings. Camber shall be measured in the Fabricator's shop in the unstressed condition, prior to erection. The Fabricator shall provide camber measurements of all beams and a report to the Testing Laboratory confirming this has been done.
 2. Where possible, camber of beams shall be applied by a cold bend process.
 3. The local application of heat may be used to introduce or correct camber, curvature, or straightness provided the temperature of the heated area, as

- measured by temperature crayons or other approved means, does not exceed 1,200°F.
4. Where indicated on the drawings in a camber diagram, cantilever or double cantilever beams shall be cambered for the main span and cantilever end separately, either by a staged cold bending process or by the application of heat.
 5. Beams and trusses detailed without specified camber shall be fabricated so that after erection any natural camber due to rolling or shop fabrication is upward.
 6. Truss Camber Tolerances: Unless noted otherwise, the tolerance for any specified camber point shall be plus or minus 1/1600 (three-quarter inch per 100 feet) of the distance from the nearest specified support point.
- G. Splices in Structural Steel: Splicing of structural steel members in the shop or the field is prohibited without prior approval of the Engineer. Any member having a splice not shown and detailed on approved shop drawings will be rejected.
- H. Compression Joints: Ends of columns, except as otherwise noted, and other compression joints at splices and other connections as noted on the drawings which depend on contact bearing as part of the splice strength shall be finished to bear in accordance with AISC Specification M2.6 so as to provide complete true bearing in accordance with AISC Specification M4.4.
- I. Cutting: Manual oxygen cutting shall be done only with a mechanically guided torch. An unguided torch may be used provided the cut is not within 1/8 inch of the finished dimension and final removal is completed by means such as chipping or grinding to produce a smooth surface quality free of notches or jagged edges. All corners shall be smooth and rounded to a minimum 1/2" radius.
- J. Anchor Rods: Furnish anchor rods and other connectors required for securing structural steel to foundations and other in-place work. Furnish 1/8" minimum steel templates for presetting bolts and other anchors to accurate locations.
- K. Large Plates to be Embedded in Concrete: For steel plates that are larger than 24"x24" and are to be embedded horizontally in and at the top surface of concrete, provide one-inch diameter holes to prevent trapped air underneath plates and to achieve full consolidation. The location of holes shall be shown on the shop drawings and shall not impair the strength of the plate.
- L. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members as shown on the contract documents, and/or the final shop drawings.
1. Provide specialty items as indicated to receive other work.
 2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
- M. Lifting and Erection Devices: The Fabricator shall be responsible for designing, detailing, and furnishing all lifting devices and erection aids required for erection. Such devices shall be removed after erection if they interfere with architectural finish requirements.

- N. Special Fabrication Requirements for Welded Splices and Moment Connections Using Groove Welds in Heavy Shapes or Heavy Plates:
1. Scope: Requirements specified herein shall apply to Heavy Shapes or Heavy Plates with groove welds.
 2. Material Verification: The Fabricator shall verify that all special material requirements in Part 2 of this specification are met.
 3. Weld Sequencing:
 - a. Perform flange welds prior to web welds, unless otherwise noted.
 - b. Sequence individual passes of multipass welds to minimize the restraint produced against the contraction of subsequent passes. For wide flange shape members with double bevel flanges, weld the inside flanges first, then the outside flanges, and lastly the web.
 4. Edge Preparations: Comply with the requirements of AISC Specification Section J1.6 and M2.2 for beam copes and weld access holes. Use of weld access hole geometry meeting the requirements of AWS D1.1 is acceptable.
- O. Drainage Holes: Provide 1 inch diameter drainage (weep) holes in all members (trusses, girders, beams, etc.) exposed to weather where rain water could collect (at low points and/or behind dams caused by connections, stiffener plates, etc.). Show all holes on shop drawings for review by the Engineer.
- P. Requirements for Heavy Shapes and Heavy Plates: Heavy Shapes and Heavy Plates shall meet the following requirements:
1. Cutting: Preheating is required. Preheat temperature shall be sufficient to prevent cracking. The minimum preheat temperature is 150 degrees F through the entire thickness; higher preheat shall be provided if necessary to prevent cracking.
 2. All cut edges shall be free of gouges and notches.
 3. Edge preparations: Copers, cuts, weld access holes, and other flame-cut edges within 12" of a groove weld, hole, or discontinuity in that section shall be ground to bright metal with a surface roughness not exceeding 1000 micro-inches and tested for cracks using the dye penetrant method.

2.3 WELDING

- A. Code: All shop and field welding shall conform to all requirements in the "Structural Welding Code – Steel", ANSI/AWS D1.1, as published by the American Welding Society (AWS).
- B. Welder Certification: All shop and field welders shall be certified according to all the applicable AWS procedures for the welding process and welding position used. Each welder shall be assigned an identifying symbol or mark and all shop and field welded connections containing complete or partial joint penetration welds, multi-pass fillet welds, and fillet welds greater than 5/16" shall be identified by the symbol or mark of the welder responsible for the connection.
- C. Minimum Size and Strength:

1. Fillet Welds: Minimum size of fillet welds shall be as specified in Table J2.4 in AISC Specification, Chapter J.
 2. Partial-Penetration Groove Welds: The minimum effective throat thickness of partial-penetration groove welds shall be as specified in Table J2.1 in AISC Specification, Chapter J.
 3. Minimum Strength of Welded Connections: Except as specified below in "Connections" or noted otherwise on the drawings, all shop and field welds shall develop the full tensile strength of the member or element joined. All members with moment connections as indicated on the drawings shall be welded to develop the full flexural capacity of the member, unless noted otherwise on the drawings.
- D. Filler Metal Requirements: Weld metal shall be as specified in Table J2.5 in AISC Specification, Chapter J and other requirements of this specification.
- E. Specialty Welding Consultant: The Fabricator shall hire a specialty welding consultant that is a professional engineer and shall have a minimum of 5 years of experience in weld engineering. The specialty welding consultant shall review the heavy weldments that are shown on the drawings for any stress relieving requirements there may be and to specify the welding sequence that will be required. The specialty welding consultant shall also write the Welding Procedure Specifications for the welds in those details.
- F. Welding Procedure Specification:
1. All welding shall be performed in accordance with a Welding Procedure Specification (WPS) as required in AWS D1.1 and reviewed by the Owner's Testing Laboratory and by the Architect/Engineer. The WPS variables shall be within the parameters established by the filler-metal manufacturer. Engage the services of an independent Testing Laboratory to provide the qualification testing required by AWS D 1.1, Chapter 4, part B to qualify any non-prequalified WPS needed for the project. The independent Testing Laboratory shall prepare Welding Procedure Qualification Records (WPQR) documenting the successful qualification of each Welding Procedure Specification.
- G. Welding Procedures:
1. All welding processes shall comply with the requirements of ANSI/AWS D1.1 unless noted otherwise.
 2. Built-up sections assembled by welding shall be free of warpage and all axes shall have true alignment.
 3. Welds not specified shall, if possible, be continuous fillet welds developing the minimum strength, as specified above, using not less than the minimum fillet welds as specified by AISC.
 4. The toughness and notch sensitivity of the steel shall be considered in the formation of all welding procedures to prevent brittle and premature fracture during fabrication and erection.
 5. The Welding Procedure Specification shall be followed without deviation unless specific approval for change is obtained from the Owner's Testing Laboratory and the Architect/Engineer.
 6. Before welding, particular attention shall be paid to surface preparation, fit up, and cleanliness of surfaces to be welded.

7. Minimum preheat and interpass temperatures for structural steel welding shall be as specified in ANSI/AWS D1.1, except that no welding shall be performed when the ambient temperature is lower than 0 degrees F. The temperature shall be measured from the side opposite that upon which the preheat is applied.
 8. The heat, input, length of weld, and sequence of weld shall be controlled to prevent distortions. The surfaces to be welded and the filler metals to be used shall be subject to inspection before any welding is performed.
 9. Welds shall be sound throughout. There shall be no crack in any weld or weld pass. Welds shall be considered sound if they conform to AWS requirements, as confirmed by non-destructive testing.
 10. Welds shall be free from overlap.
 11. Craters shall be filled to the full cross section of the welds.
 12. For high-strength low-alloy steels, follow welding procedures as recommended by steel producer for exposed and concealed connections.
 13. Fabricator and Erector shall coordinate welding responsibility at all welded joints.
- H. Stress Relieving: All welding sequences shall be such as to reduce the residual stresses due to welding to a minimum value. If high residual stresses are present, stress relieving of joints shall be required. Welded connections shall be detailed and designed to minimize the accumulation and concentration of through-thickness strains due to weld shrinkage. Heavy weldments that are to be reviewed for stress relieving requirements by a Specialty Welding Consultant are identified on the drawings.

2.4 BOLTING

- A. Bolt Diameter: Minimum bolt diameter shall be 3/4 inch. The difference in diameter between bolts of differing sizes used on the project shall be not less than 1/4".
- B. Connection Type: Unless noted otherwise on the drawings, all bolted connections shall be snug-tightened using high-strength bolts in standard holes (hole diameter nominally 1/16 inch greater than the nominal bolt diameter) with threads included in the shear planes. Notwithstanding, the contractor shall be responsible to adhere to provisions of ANSI/AISC 360 Section J1.10, which lists circumstances under which certain connections require pretensioned high strength bolts.
- C. Oversize, Short-Slotted and Long-Slotted Holes: The dimensions and washer requirements of oversize, short-slotted, and long-slotted holes shall conform to ANSI/AISC 360 Table J3.3.
- D. Fastener Tension:
 1. High strength bolts in snug-tightened joints shall be tightened to a snug tight condition only. Do not pretension bolts in snug-tightened joints the same as if they were in slip-critical joints. The snug-tightened condition is defined as the tightness that exists when all plies are in firm contact. This may usually be attained by a few impacts of an impact wrench or the full effort of an ironworker using an ordinary spud wrench. If Twist-Off-Type Tension-Control

Bolt Assemblies are used in snug-tightened joints, do not fully tension bolts and leave the splines intact.

2. High-strength Bolts in Slip-critical and Pretensioned Joints:
 - a. High-strength bolts in slip-critical and pretensioned joints shall be tightened to achieve the minimum bolt tension as specified in the RCSC's "Specification for Structural Joints using High-Strength Bolts" when all the fasteners of a joint are tight.
 - b. Any of the four methods to tighten bolts specified in the RCSC Specification may be used to achieve the minimum bolt tension. The tightening procedure that uses direct tension indicator washers shall conform to the requirements of ASTM F 959. Conform to the requirements of ASTM F 1852 for a Twist-Off-Type Tension-Control bolt pretensioning.
- E. Washers: Washers under the bolt head and/or nut shall be used as required by the RCSC Specification.
- F. Bolt Lubrication: All bolts shall be well lubricated at time of installation. Dry, rusty bolts are not be allowed.
- G. Impact Wrenches: Properly sized and lubricated air impact wrenches with adequate air pressure shall be utilized for all bolt installation.
- H. New Bolts: All bolts shall be new and shall not be reused.

2.5 CONNECTIONS

- A. Conceptual connection details with the required member design forces are shown on the drawings for bidding purposes and are applicable to all connections not designed and completely detailed on the drawings. The conceptual details are provided only to indicate the connection type required and may not fully represent the complexity of the connection as required by the final connection design for the forces they must resist. Except as noted below, the Fabricator is responsible for engaging the services of a professional engineer to prepare a final connection design for submission that meets the requirements of the conceptual connection details and resists the indicated design forces. Refer to the drawings and specifications for complete requirements.

By bidding this project, the fabricator acknowledges that additional connection elements may not be specifically shown in the conceptual details but may be required by the final connection design, such as stiffener plates, doubler plates, supplement/reinforcing plates or other connection material. The fabricator is responsible to include within his bid all material and labor required to conform to the intent of the conceptual details and to carry the design forces indicated, regardless of whether or not all connection elements (such as stiffener plates, doubler plates, supplement/reinforcing plates or any other connection material) required by final connection design are shown in the conceptual detail.

- B. Typical connection details are indicated on the drawings.
- C. Design and Detailing Procedure:

1. Unless noted otherwise or specifically detailed on the drawings, end connections of beams, girders, and trusses shall be designed as flexible and the connection shall accommodate end rotations of the unrestrained beams. Restrained end connections, as indicated on the drawings, shall be designed for the combined effect of bending moment and shears induced by the rigidity of the connection. Forces to be used in the design are described below.
 2. The Fabricator's licensed professional engineer shall design and submit sealed calculations documenting the design and showing details of the assembled joint with the bolts and welds required for the conditions noted below:
 - a. For each connection not otherwise completely detailed on the drawings.
 - b. Where connections are encountered on the project that do not match those assumed in the AISC Manual.
 3. Where connections are of the type that can be selected or completed using information found in tables in the AISC "Steel Construction Manual", sealed calculations need not be submitted provided the project design conditions precisely match those assumed in the referenced publications. For conditions encountered on the project that do not conform to the AISC Manual, a complete design shall be prepared and submitted for Engineer's review.
 4. The Fabricator's licensed professional engineer shall seal all design calculations.
 5. The Engineer reserves the right to reject all shop drawings submitted without complete design calculations if required. Failure to adhere to the requirements of this section obligates the Contractor to take responsibility for any and all resulting delays in the detailing and fabrication of structural steel.
 6. The Fabricator, his detailer, and professional engineer shall coordinate all connection requirements with the Erector. The Fabricator is responsible to detail connections that contain the adjustability and all other requirements that allow the Erector to erect the structural steel in conformance to all specified tolerances. The Fabricator shall be responsible for providing adjustability in all connections between exterior-cladding systems, skylights, and other architectural features and the supporting structural steel as required in achieving the specified tolerances for the architectural feature as specified in the contract documents or per the manufacturer's requirements.
- D. Design Intent: It is the intention of the plans and specifications that shop connections be welded or bolted and that field connections be bolted, unless detailed otherwise on the drawings.
- E. Preliminary Connection Review: The fabricator shall submit preliminary details of proposed typical connections for Engineer review not less than 14 days prior to the start of preparation of detailed shop drawings. Proposed variations from the details shown on the drawings will be considered and such variations must obtain preliminary approval from the Engineer prior to preparation of detailed shop drawings.
- F. Flexible (Simple) Beam Connections:
1. All typical beam simple connections shall conform to requirements of the AISC specifications. Refer to the drawings for typical connection types.

2. Beam connections shall conform to the "Structural Integrity" requirements of the governing Building Code.
3. Seated beam connections and stiffened seated beam connections shall not be used unless indicated on the drawings or unless Engineer approval is obtained to verify capacity of supporting member for the resulting eccentricity. The Fabricator must verify and bear responsibility that the use of such connections does not interfere with architectural or MEP requirements.
4. Simple Beam Connection Capacity: Support a factored load reaction R equal to the reaction shown on the plans. Contact the Engineer if no reaction for a beam is shown on the plan. Each connection shall contain not less than the minimum number of bolts shown in the AISC connection tables for each beam size.

G. Restrained (Moment) Connections:

1. Refer to the drawings for moment connection details.
2. Moment connections shall conform to the "Structural Integrity" requirements of the governing Building Code.
3. Design Reactions for Moment Connected Beams: Shear connections for moment-connected beams shall be designed for the factored reactions shown on the drawings.
4. Design and Furnishing of Reinforcement in Moment Connected Joints: As part of the design responsibility outlined above, the fabricator shall design and furnish all additional reinforcement in moment connected joints to resist the specified design forces unless otherwise specifically detailed on the drawings. Column sections shall be investigated for web shear, web yielding, web buckling, and tension. Stiffeners and/or doubler plates shall be furnished as required by the AISC Specification Section J10.

H. Tightening of Bolts in Welded Moment Connections: At moment connections where beams are complete-joint penetration welded directly to columns or girders in the field, welds shall be made after installation of erection bolts to draw the pieces together and before the final shear connection bolts are tightened. Where loose moment plates are used, such plates shall be groove welded to columns prior to connecting these plates to the beams.

I. Column Splices:

1. Compression Splice: Unless indicated otherwise on the drawings, all column splices shall be either a bolted compression splice using high strength snug-tightened bolts or a welded compression splice. Splice and filler plate sizes, thicknesses, and number of fasteners or weld information shall be as shown in Table 14-3 of AISC "Steel Construction Manual". It shall be the Fabricator's responsibility to examine the architectural drawings to verify that splice plates and fasteners do not violate architectural finish requirements.
2. Column splices shall conform to the "Structural Integrity" requirements of the governing Building Code.
3. Bearing and Fit-Up of Column Compression Joints: All column splices, except those that are direct welded with complete-joint penetration welds, shall be

considered as a compression joint as defined herein unless noted otherwise on the drawings.

J. Base Plates and Bearing Plates:

1. Finish: All baseplates and bearing plates shall be finished in accordance with AISC Specification M2.8.
2. Anchor Rod Holes in Baseplates: Hole sizes in baseplates for anchor rods shall be per the AISC "Steel Construction Manual", Table 14-2.

K. Hangers and Braces:

1. Connections for all hangers and braces shall have connections designed to develop the factored axial force shown on the drawings. Contact the Engineer if no force for a member is shown on the drawings.
2. Compression members composed of two or more rolled shapes separated from one another by intermittent fillers shall be connected to one another at such fillers at intervals (not to exceed 48") so that the slenderness ratio l/r of either shape, between the fasteners, does not exceed 75% of the governing slenderness ratio of the built-up member. The least radius of gyration, r , shall be used in computing the slenderness ratio of each component part.

L. Stiffeners: Provide stiffeners finished to bear under load concentrations where shown on the drawings.

M. Steel Shelf Angles: Shelf angles supporting veneer shown on the drawings to be continuous shall be furnished to a maximum length of 20'-0". Provide a 1/4" gap at each joint. The gap shall not be welded. The distance from the joint to the first supporting bolt shall not exceed 40% of the bolt spacing (12" maximum). Shelf angles shall be continuous around corners with corner joint complete-joint penetration welded. The distance to the first supporting bolt from the corner shall not exceed 12".

N. Limitations on Use of A307 Bolts: ASTM A 307 bolts shall not be used in any permanent steel-to-steel or concrete-to-steel connection.

O. Bolts in Combination with Welds: Bolts shall not be considered as sharing the load in combination with welds, except as allowed in AISC Specification Section J1.8.

2.6 SURFACE PREPARATION AND SHOP PRIME PAINTING

A. Specification: Surface preparation, paint, and painting practices shall conform to the "SSPC Painting Manual", Volumes 1 and 2.

B. Scope: All steel shall remain unpainted, except the following:

1. Shop paint surfaces that are to remain exposed to view in the final construction.
2. Shop paint any steel other than weathering steel that, in the final construction, will not be in a controlled environment and is therefore subject

to moisture or high humidity infiltration and that has not been specified to be galvanized.

3. Shop paint any steel that is shown on the drawings to receive a finished paint system as defined in Specification 099100.
4. Coordinate all shop painting of structural steel with Architect's painting requirements as specified on the architectural drawings and in the specifications. The Fabricator shall be responsible for determining all painting requirements (which surfaces are to be painted or left unpainted) on the project prior to fabrication.

C. Additional Painting Requirements:

1. Extend shop paint to 2" from location of welds on surfaces that are to be field welded.
2. All unpainted mating surfaces of all elements that are welded together into an assembly that is permanently exposed to the exterior shall be seal welded in addition to structural welding requirements.
3. If individual elements (including the mating surfaces) of an assembly that is required to be painted are painted prior to welding into an assembly, then all painted surfaces affected by welding shall be touched-up and repaired (according to manufacturer's instructions, if any) to prevent corrosion bleeding.
4. The fabricator shall be responsible to ensure that all elements of all assemblies that are to be painted are fabricated so that no exposed surface shall be subject to stains due to corrosion bleeding during the warranty period of the paint.
5. Structural steel elements that are bolted with slip-critical joints and are required on the drawings to be painted shall have all faying surfaces (including all surfaces of filler plates, member end supplement plates, and welds) painted to comply with the specified slip-critical coating requirement.

D. Surface Preparation – Unpainted Steel: All structural steel that is not specified to receive a shop coat of primer paint shall be prepared in accordance with Society for Protective Coatings specifications as follows:

1. SSPC-SP 2, "Hand Tool Cleaning" or SSPC-SP 3, "Power Tool Cleaning" unless otherwise specified.
2. SSPC-SP 6, "Commercial Blast Cleaning" shall be applied to the faying surfaces of connections that are noted on the drawings as slip-critical connections requiring a Class B surface. Apply this surface preparation to the area surrounding all bolt holes including the area up to 2" outside the outer-most holes.

E. Surface Preparation and Primer Paint – Shop Painted Steel:

1. Surface Preparation: Prepare the surface of all structural steel specified to be shop painted as required by the paint manufacturer or the Society for Protective Coatings specifications, but not less than the following:
 - a. SSPC-SP 2, "Hand Tool Cleaning" or SSPC-SP 3, "Power Tool Cleaning" unless otherwise specified.

- b. SSPC-SP 6, "Commercial Blast Cleaning" shall be applied to the faying surfaces (including filler and member-end supplement plates, if any) of connections that are noted on the drawings as requiring a slip-critical coating. At a minimum, apply this surface preparation to the area between and surrounding all bolt holes including the area up to 2" outside the outer-most holes.
 2. Priming: Immediately after surface preparation, apply primer to all structural steel specified to be shop primed in strict accordance with manufacturer's instructions and the Society for Protective Coatings specifications. Apply paint at a rate to conform to the manufacturer's written instructions and to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, welds, and all exposed surfaces. Apply two coats to surfaces that are inaccessible after assembly or erection. Change the color of the second coat to distinguish it from the first coat.
 3. Finish Coat: Coordinate shop primer paint requirements with architectural drawings and specifications. The primer selected must be compatible with any specified finish coat.
- F. Shop Touch-Up Painting: The Fabricator shall provide for cleaning and touch-up painting of welds, bolted connections (including nuts, bolts, washers, filler plates, member end supplement plates and welds, if any), and abraded areas. Prior to shipment, apply paint to exposed areas using same materials and surface preparation as used for shop painting. Paint shall be applied by brush or spray with minimum dry film thickness of 1.5 mils.

2.7 SOURCE QUALITY CONTROL

- A. Source Testing and Inspection: Refer to Specification 014529 "Structural Testing and Inspections" for testing and inspection requirements associated with structural steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Inspection Prior to Erection: Erector shall examine areas and conditions under which structural steel work is to be installed and notify the Contractor and the Architect/Engineer in writing of conditions detrimental to proper and timely completion of the work.

3.2 PREPARATION

- A. Temporary Shoring and Bracing:
 1. The lateral-load resisting or stability-providing system and connecting diaphragms are identified on the drawings. Comply with the provisions of the

- Code of Standard Practice regarding stability of the structure during the erection process, except where stricter requirements are noted herein.
2. The Erector shall design and provide all required temporary shoring and bracing to hold structural framing securely in position and to safely withstand all loads as specified in the Code of Standard Practice and ASCE 37 unless larger loads are required by the local building code or specified herein. Provide all bracing, any additional structural members, and increase member sizes and/or connections shown on the drawings as required to accommodate the erection loads, methods, sequence of erection, and equipment until the lateral-load resisting or stability-providing system is completely installed. Clearly show all temporary supports and modifications to designed members on the Shop Drawings and the Erection-bracing Drawings. A qualified licensed professional engineer, hired by the Erector, shall design the temporary shoring and bracing and shall seal the erection-bracing drawings.
 3. Where architectural or MEP requirements do not allow for any temporary supports, members, erection devices, or connections to be left in place permanently or where such items affect the final structural behavior, they shall be removed by the Erector. All costs associated therewith shall be included in the bid price.

B. High-Strength Bolt Testing:

1. The Erector shall perform the following tests for high-strength bolts:
 - a. The Rotational Capacity Test shall be performed on the following combinations of fastener assembly lots prior to use in the project.
 - 1) All bolts in long-span trusses.
 - 2) All ASTM A 490 bolts 1-1/4" diameter and larger.
 - 3) All ASTM A 490 bolts when coated with Dacromet or other protective coating.
 - b. The Rotational Capacity Test shall be performed in accordance with ASTM F 3125-15 Annex A2 and with the following sampling rate:
 - 1) Test all black or galvanized bolt, nut, and washer assemblies.
 - 2) Test each combination of bolt production lot, nut lot, and washer lot as an assembly and assign a lot number to each lot tested.
 - 3) Test two samples from each assigned assembly lot.
 - c. Results of each Rotational Capacity Test shall be submitted to the Testing Laboratory for review.
2. The Testing Laboratory shall perform the following tests for connections joined with high-strength bolts:
 - a. Perform Arbitration Testing according to procedures outlined in the "Specification for Structural Joints using High-Strength Bolts" when a disagreement exists between the Testing Laboratory and the Fabricator as to the minimum tension of installed bolts that have been inspected according to paragraph below.

3.3 ERECTION

- A. The erection work shall comply with the requirements of AISC Specification Section M4.
- B. Surveys: The following surveys shall be performed by a qualified land surveyor:
 - 1. Initial Survey: Check elevations of concrete and masonry bearing surfaces, anchor bolt locations, embedded connection plates, and all dimensions of existing structures to which new connections are to be made prior to erection and submit any discrepancies to the Engineer prior to the start of erection. Corrections or compensating adjustments to the structural steel shall be made and approved prior to the start of erection.
 - 2. Final Survey: Upon completion of erection of the steel frame, and before the start of work by other trades that may be supported, attached, or applied to the frame, a final survey shall be made and a report submitted certifying compliance with specified tolerances.
- C. Erection Tolerances: Erection tolerances of anchor rods, embedded items, and all structural steel shall conform to the AISC Code of Standard Practice, Section 7, unless stricter tolerances are specified elsewhere in the contract documents.
 - 1. Erection of Long-span Steel:
 - a. Refer to the Structural Drawings for a recommended steel erection sequence. A detailed written erection procedure that has been reviewed and approved by the Erector and the General Contractor shall be submitted for review and approval by the Engineer.
 - b. Design, provide all material for, and construct all erection towers as required to erect the long-span steel system.
 - c. An alternate erection procedure may be proposed by the contractor as a substitution under the Division 01 specifications. The contractor shall hire a registered professional engineer to do a complete structural analysis of the long-span system to ensure strength and stability requirements are met during all stages of the erection. Calculations prepared under the supervision of the registered professional engineer showing the size and stability checks of the long-span system shall be submitted for review and approval by the Engineer-of-Record. Detailed shop drawings prepared under the supervision of the registered professional engineer of all necessary hardware and any reinforcing of the long-span system shall be submitted for review by the Engineer.
- D. Wherever the erection equipment is supported by the structure, the contractor shall be responsible for the retention of a licensed professional engineer to determine the adequacy of the member supporting the erection equipment in relation to the loads imposed thereon. The Contractor shall submit to the Architect/Engineer, for review, the loads that will be imposed by the erection equipment on the building structure. Where the imposed load exceeds the allowable strength, the Contractor shall be responsible for any additional materials, supports, bracing, connections and similar measures required to support the imposed load of the equipment while in use, subject to review by the Architect/Engineer.

- E. Anchor Rods: 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 prior to packing with grout. Use only steel wedges or shims.
- F. Base Plates and Bearing Plates: Remove loose latent material from bearing surfaces and base and bearing plates. Set plates to the elevation indicated on the drawings and level using steel shims (plastic shims will not be allowed) or by three leveling screws with weldments at the plate edges. After all protruding plates have been trimmed, grout plates solidly between bearing surfaces using the specified grout, ensuring no voids are present. Finish exposed surfaces, protect installed materials, and allow to wet cure. For proprietary grout materials, comply with manufacturer's instructions. Tighten anchor bolts after supported members have been positioned and plumbed.
- G. Splices: Splices will be permitted only where indicated on the contract drawings and approved shop drawings. Fastenings of splices of compression members shall be done after the abutting surfaces have been brought completely into contact within AISC tolerances. Bearing surfaces and surfaces that will be in permanent contact are to be cleaned before the members are assembled.
- H. Field Assembly of Structural Steel:
 - 1. As erection of the steel progresses, the work shall be fastened securely to safely carry all dead load, wind, and erection forces. Particular care shall be exercised to ensure straightness and tautness of bracing immediately upon raising a steel column.
 - 2. Provide temporary planking and working platforms as necessary to effectively complete work.
 - 3. Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment. Level and plumb individual members of structure within specified AISC tolerances. The Contractor shall coordinate with Erector and Fabricator regarding possible discrepancies in member lengths between temperature at time of fabrication and temperatures during erection, and shall make necessary adjustments to ensure plumbness within AISC tolerances at 70°F. Compensate for cumulative welding draw, construction loadings, sequential applications of dead loads, or any other predictable conditions that could cause distortions to exceed tolerance limitations.
 - 4. On welded construction exposed to view or weather, remove erection bolts, fill holes with plug welds or filler and grind smooth at exposed surfaces.
 - 5. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces receiving field welds.
 - 6. Comply with all bolting and welding requirements of Part 2 of this specification.
- I. Field Modifications to Structural Steel: Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and structural fitting of parts shall be reported immediately to the Architect/Engineer,

and approval of the method of correction shall be obtained. Approved corrections shall be made at no additional cost to the Owner. Do not use cutting torches, reamers, or other devices in the field for unauthorized correction of fabrication errors.

- J. Miscellaneous Framing: Provide supplemental structural steel support framing for steel deck where columns, or other framing members or floor openings interrupt normal deck bearing whether shown or not on the architectural, mechanical, or structural drawings.
- K. Removal of Erection Aids and Devices: The Erector shall remove all erection aids and devices that interfere with architectural finish or MEP requirements.
- L. Field Touch-Up Painting:
 - 1. Clean field welds, unpainted areas of bolted connections (including all exposed areas of nuts, bolts, washers, filler plates, member end supplement plates, and welds), and any shop painted areas that are abraded. Apply paint to all exposed areas using same material and surface preparation as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.
 - 2. Clean field welds, ungalvanized areas of bolted connections (including all exposed areas of nuts, bolts, washers, filler plates, member end supplement plates, and welds), and any galvanized areas that are abraded. Prepare surfaces and apply two coats of the specified galvanizing repair paint in accordance with ASTM A 780.
 - 3. The Contractor shall ensure that, at the substantial completion of the project, all structural steel, bolted and/or welded, required to be painted shall have all necessary steel surfaces painted (including touch-up painting as required) to prevent corrosion bleeding.
- M. Shear Connector Installation:
 - 1. Composite Beams:
 - a. Studs shall be welded in the field (not the shop) using automatically timed stud welding equipment.
 - b. The top flange of the beams must be unpainted and free of heavy rust, mill scale, dirt, sand or other foreign material which will interfere with the welding operation.
 - c. The steel deck must be free of dirt, sand, oil, or other foreign material and must be dry and free of moisture. Steel deck must rest tightly on the beam flange. Welding must take place through only one thickness of deck.
 - d. Stud Spacing: Studs shall be spaced on beams and girders as shown on the drawings.
- N. Headed Stud Anchor Installation:
 - 1. Steel Plates Embedded in Concrete:
 - a. Studs shall be welded using automatically timed stud welding equipment.

- b. Plates must be unpainted and free of heavy rust, mill scale, dirt, sand or other foreign material that will interfere with the welding operation.
- O. Crane Runways: Install runways complete with columns, girders, beams, bracing, rails, crane stops and other required items. Set and adjust gauge, alignment and elevation of crane rails to tolerances of Association of Iron and Steel Engineers (AISE) Standard No. 13, "Specifications for the Design and Construction of Mill Buildings", unless otherwise indicated. Stagger joint locations in opposite rails. Do not locate joints in rails over crane girder joints.
- P. Clean Up: Clean up all debris caused by the Work of this Section, keeping the premises neat and clean at all times.

3.4 FIELD QUALITY CONTROL

- A. Field Testing and Inspection: Refer to Specification 01 45 29 "Structural Testing and Inspections" for testing and inspection requirements associated with structural steel.

END OF SECTION 05 12 00

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SECTION 05 12 13

ARCHITECTURALLY EXPOSED STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Architecturally exposed structural steel (AESS).
2. Section 05 12 00 "Structural Steel Framing" requirements that also apply to AESS.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel fabrications and other metal items not defined as structural steel.
2. Section 09 91 23 "Interior Painting" for surface preparation and priming requirements for interior steel.
3. Section 09 96 00 "High-Performance Coatings" for surface preparation and priming requirements for exterior steel.

1.2 DEFINITIONS

A. AESS: Architecturally exposed structural steel.

- ###### B. Category AESS 3 (For columns up to first beam): Structural steel that is categorized by ANSI/AISC 303, Section 10, as AESS 3 and is designated as AESS 3 or Category AESS 3 in the Contract Documents.

1.3 COORDINATION

- ###### A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

A. Product Data:

1. Tension-control, high-strength, bolt-nut-washer assemblies.
2. Corrosion-resisting (weathering steel), tension-control, high-strength, bolt-nut-washer assemblies.
3. Filler.

4. Etching cleaner.
 5. Galvanized repair paint.
- B. Shop Drawings: Show fabrication of AESS components. Shop Drawings for structural steel may be used for AESS.
1. Identify AESS category for each steel member and connection, including transitions between AESS categories and between AESS and non-AESS.
 2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 3. Include embedment Drawings.
 4. Indicate orientation of mill marks and HSS seams.
 5. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.
 6. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections. Indicate orientation and location of bolt heads.
 7. Indicate exposed surfaces and edges and surface preparation being used.
 8. Indicate special tolerances and erection requirements.
 9. Indicate weep holes for HSS.
 10. Indicate surface preparation, primer, and coating requirements, including systems specified in other Sections.
- C. Samples: Submit Samples to set quality standards for AESS.
1. Steel plate, 3/8 by 8 by 8 inches (9.5 by 200 by 200 mm), with one end of a short length of rectangular steel tube, 4 by 6 by 3/8 inches (100 by 150 by 9.5 mm), welded to plate with a continuous fillet weld and with weld ground smooth and blended.
- 1.6 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For fabricator.
- 1.7 QUALITY ASSURANCE
- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172) and is experienced in fabricating AESS similar to that indicated on this Project.
 - B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program, is designated an AISC-Certified Erector, Category CSE, and is experienced in erecting AESS similar to that indicated on this Project.
 - C. Mockups: Build mockups of AESS to set quality standards for fabrication and installation.

1. Build mockup of typical portion of AESS as shown on Drawings.
2. Coordinate painting requirements with Section 09 91 23 "Interior Painting" for interior painting.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Use special care in handling AESS to prevent twisting, warping, nicking, and other damage during fabrication, delivery, and erection. Store materials to permit easy access for inspection and identification. Keep AESS members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect AESS members and packaged materials from corrosion and deterioration.
 1. Do not store AESS 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.

1.9 FIELD CONDITIONS

- A. Field Measurements: Where AESS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of ANSI/AISC 303, Sections 1 through 9 and as modified in Section 10, "Architecturally Exposed Structural Steel."

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. Tension-Control, High-Strength, Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, round-head assemblies consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, (ASTMA563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 1. Finish: Plain.
- B. Corrosion-Resisting (Weathering) Steel, Tension-Control, High-Strength, Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 3, round-head assemblies consisting of steel structural bolts with splined ends; ASTM A563, Grade DH3, (ASTM A563M, Class 10S3) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 3, hardened carbon-steel washers.

2.3 FILLER

- A. Polyester filler intended for use in repairing dents in automobile bodies.

2.4 PRIMER

A. Steel Primer:

1. Comply with Section 09 91 23 "Interior Painting" for interior painting.

2.5 FABRICATION

A. Shop fabricate and assemble AESS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection.

1. Use special care handling and fabricating AESS before and after shop painting to minimize damage to shop finish.

B. Category AESS 3:

1. Comply with overall profile dimensions of AWS D1.1/D1.1M for welded built-up members. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
2. Prepare surfaces according to Part 2 "Shop Priming" Article and SSPC-SP 6 (WAB)/NACE WAB-3.
3. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and eased edges.
4. Make intermittent welds appear continuous, using filler or additional welding.
5. Seal weld open ends of hollow structural sections with 3/8-inch (9.5-mm) closure plates.
6. Limit butt and plug weld projections to 1/16 inch (1.6 mm).
7. Install bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
8. Remove weld spatter, slivers, and similar surface discontinuities.
9. Remove blemishes and surface irregularities resulting from temporary braces or fixtures by filling or grinding, before cleaning, treating, and shop priming.
10. Grind tack welds smooth unless incorporated into final welds.
11. Remove backing and runoff tabs, and grind welds smooth.
12. Limit as-fabricated straightness tolerance to one-half that permitted for structural-steel materials in ANSI/AISC 303.
13. Limit as-fabricated curved structural steel tolerance to that permitted for structural-steel materials in ANSI/AISC 303.
14. Limit as-fabricated straightness tolerance of welded built-up members to one-half that permitted by AWS D1.1/D1.1M.
15. Conceal fabrication and erection markings from view in the completed structure.
16. Make welds uniform and smooth.

17. Cut out mill marks from mill material or hide these markings from view in the completed structure. Where neither method is possible, remove mill marks by grinding and filling surfaces as approved by Architect.
 18. Grind butt and plug welds smooth or fill, removing weld splatter exposed to view.
 19. Orient HSS seams as indicated or away from view.
 20. Align and match abutting member cross sections.
 21. At visible open joints of copes, miters, and cuts, maintain uniform clear gaps of 1/8 inch (3.2 mm). At closed joints, maintain uniform contact within 1/16 inch (1.6 mm).
 22. Fabricate with exposed surfaces smooth, square, and of surface quality approved by Architect.
- C. Erection marks, painted marks, and other marks are permitted on galvanized- steel surfaces of completed structure.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
1. Joint Type: Pretensioned.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments, showing dimensions, locations, angles, and elevations.
- B. Examine AESS for twists, kinks, warping, gouges, and other imperfections before erecting.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep AESS secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when

permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

- A. Take special care during erection to avoid marking or distorting the AESS and to minimize damage to shop painting. Set AESS accurately in locations and to elevations indicated and according to ANSI/AISC 303 and ANSI/AISC 360.
1. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Take care to avoid any blemishes, holes, or unsightly surfaces resulting from the use or removal of temporary elements.
 2. Grind tack welds smooth.
 3. Remove backing and runoff tabs, and grind welds smooth.
 4. Orient bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
 5. Conceal fabrication and erection markings from view in the completed structure.
- B. In addition to ANSI/AISC 303, Section 10 requirements, comply with the following.
1. Erection of Category AESS 3:
 - a. Erect AESS to the standard frame tolerances specified in ANSI/AISC 303 for non-AESS.
 - b. Comply with AWS D1.1/D1.1M. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
 - c. Remove weld spatter, slivers, and similar surface discontinuities.
 - d. Grind off butt and plug weld projections larger than 1/16 inch (1.6 mm).
 - e. Continuous welds shall be of uniform size and profile.
 - f. Ream holes that must be enlarged. Use of drift pins or burning is not permitted. Replace misaligned connection plates where holes cannot be aligned with acceptable appearance.
 - g. Splice members only where indicated on Drawings.
 - h. No torch cutting or field fabrication is permitted.
 - i. Weld profiles, quality, and finish shall be as approved by Architect.
 - j. Make joint welds, including tack welds, appear continuous by filling intermittent welds.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
1. Joint Type: Pretensioned.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

3.5 REPAIR

A. Touchup Painting:

1. Cleaning and touchup painting are specified in Section 09 91 23 "Interior Painting."

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to inspect AESS as specified in Section 05 12 00 "Structural Steel Framing." The testing agency is not responsible for enforcing requirements relating to aesthetic effect.
- B. Architect will observe AESS in place to determine acceptability relating to aesthetic effect.

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 01 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. Supplier: The steel deck supplier shall furnish all steel deck materials and accessories indicated on the Architectural, Structural, and Mechanical Drawings required to produce a complete job including but not necessarily limited to deck units, cover plates, steel deck edge closures, cell closures, cant strips, sump pans, and all related accessories.
- B. Erector: The Subcontractor responsible for erecting the steel deck shall provide all labor and equipment as required to place all steel deck components and accessories as described above.
- C. Related Requirements:
 - 1. Specification 01 45 29 "Structural Testing and Inspections" for inspection requirements associated with cast-in-place concrete.
 - 2. Specification 01 81 13 "Sustainable Design Requirements" for sustainable design requirements.
 - 3. Specification 03 20 00 "Concrete Reinforcing" for reinforcement in steel deck slabs.
 - 4. Specification 03 30 00 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.

1.3 REFERENCES

- A. Definitions:
 - 1. Professional Engineer: A professional engineer who is licensed to practice engineering in the state where the project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with steel decking that are similar to that indicated for this Project in material.

B. Reference Standards:

1. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified.
 - a. AISI, "Specification for the Design of Cold Formed Steel Structural Members."
 - b. AWS D1.3, "Structural Welding Code - Sheet Steel."
 - c. SDI, "Design Manual for Composite Decks, Form Decks, and Roof Decks."

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Quality Control: The Contractor is responsible for quality control, including workmanship and materials furnished by subcontractors and suppliers.
2. Document Conflict and Precedence: In case of conflict among documents, including architectural and structural drawings and specifications, notify the Architect/Engineer prior to submitting proposal. In case of conflict between and/or among the structural drawings and specifications, the strictest interpretation shall govern, unless specified otherwise in writing by the Architect/Engineer.
3. Materials and installed work may require testing and retesting, as directed by the governing building code or the Architect/Engineer, at any time during progress of work.
 - a. The Contractor shall provide adequate notification to the Owner's Testing Agency of construction operations including the project schedule to allow the Testing Agency to schedule inspections. Failure to notify sufficiently may result in additional costs incurred by the Testing Laboratory that may be back-charged to the Contractor by the Owner.
 - b. The Contractor shall cooperate with laboratory personnel, provide access to the work, and provide access to manufacturer's operations.
 - c. The Contractor shall make adequate arrangement with the Owner's Testing Agency for inspection of material stockpiles and facilities.
 - d. The Contractor shall provide to the laboratory certificates and representative samples of materials proposed for use in the work in quantities sufficient for accurate testing as specified.
 - e. The Contractor shall furnish casual labor, equipment, and facilities as required for sampling and testing by the laboratory and otherwise facilitate the required inspections and tests.
 - f. Inspection or testing by the Owner does not relieve the Contractor of his responsibility to perform the Work in accordance with the Contract Documents. Tests not specifically indicated to be done at the Owner's expense, including retesting of rejected materials and installed work, shall be done at the Contractor's expense. See 014529 Structural Testing and Inspections section of the Specifications.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions for each type of deck specified.
- B. Shop Drawings: Submit detailed shop drawings showing type of deck, complete layout, attachment details, closures, edge strips, pans, deck openings, special jointing, supplementary framing, and all other accessories.
- C. Certificates: Submit a certificate of product compliance with SDI standards as specified.
- D. Delegated Design Submittals: If the submitted deck does not comply with the minimum properties shown on the drawings, the steel deck manufacturer shall submit design calculations sealed by a Professional Engineer verifying compliance with the specifications for all load and span conditions shown on the drawings.
- E. Qualification Statements:
 - 1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests as specified in the "Qualifications" section under Part 1. If recertification of welders is required, retesting will be at Contractor's responsibility.
- F. Insurance Certification: Assist Architect and Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire, windstorm, and extended coverage insurance.
- G. Minutes of Preinstallation Meeting: Submit for review.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Supplier: The steel deck supplier shall be a manufacturer with a minimum of two years of successful experience and with a minimum of two successful projects of a comparable size and scope to this project.
 - 2. Erector: The steel deck erector shall have a minimum of two years of successful experience and with a minimum of two successful projects of a comparable size and scope to this project.
 - 3. Welding Qualifications: Qualify welding processes and welding operators in accordance with AWS D1.3 procedures.
 - 4. Professional Engineer: The professional engineer employed by the Deck Supplier for deck design shall be experienced in the specific area of steel deck design with demonstrated experience of not less than three projects of similar scope and complexity.

PART 2 - PRODUCTS

2.1 COMPOSITE FLOOR DECK

A. General Requirements

1. See the drawings for location of steel deck types and for depth of deck, design deck properties, design deck yield strength, concrete type, total slab thickness, slab reinforcing, and design superimposed loads. The average rib width to depth of deck ratio shall be greater than or equal to 2.0. The deck properties specified are the values used for the design of the deck shown on the drawings. Provide deck with the depth as noted and other properties equal to or greater than the values stated on the drawings except that a deck with properties less than those stated, other than depth, may be used provided that the deck manufacturer take responsibility for the design of the deck. The design shall include the ability to carry the construction dead loads and design superimposed loads indicated for all the spans shown on the drawings and to meet all performance criteria as specified by the SDI. 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".
2. Acceptable manufacturers include the following:
 - a. ASC Steel Deck.
 - b. Canam Steel Corp.
 - c. New Millennium Building Systems, Inc
 - d. Cordeck.
 - e. DACS, Inc.
 - f. Marlyn Steel Decks, Inc.
 - g. New Millennium Building Systems, Inc.
 - h. Roof Deck, Inc.
 - i. United Steel Deck, Inc.
 - j. Valley Joist, Inc.
 - k. Verco Manufacturing Co.
 - l. Vulcraft/Div. Nucor Corp.
 - m. Other manufacturers may be used only with Architect/Engineer approval.

B. Grade of Steel:

1. Composite steel deck shall be cold formed from steel sheets conforming to ASTM A1008 or ASTM A653, Structural Steel Grade, with a minimum yield strength as stated on the drawings. The delivered thickness of the uncoated steel shall not be less than 95% of design thickness. Sheet metal accessories shall conform to the same material specification as the deck product.

C. Finish:

1. Galvanized: Composite steel deck shall be galvanized with a protective zinc coating conforming to ASTM A653 G90.

2. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces complying with Department of Defense Specifications DOD-P-21035.

D. Fabrication:

1. Steel Deck Spans: The deck properties shown on the drawings are selected so that the spans do not exceed the maximum clear spans with unshored construction as required by SDI criteria unless indicated otherwise on the drawings. The deck manufacturer shall be responsible for supplying a deck that meets that criterion. Where possible, all steel deck shall extend over three or more spans. Simple span deck will not be permitted unless it is shored at midspan or approved by EOR. Any additional concrete topping specified over the composite slab shall be placed after the slab has reached 75% of its design strength.

2.2 ROOF DECK

A. General Requirements:

1. See General Notes on the drawings for the location, depth of deck, design thickness, and type of deck required.

B. Grades of Steel:

1. Steel deck shall be manufactured from steel conforming to ASTM A1008 Grades C, D, or E for painted deck or A653, Structural Steel Grade for galvanized deck or Engineer approved equal, having a minimum yield strength as stated on the drawings.

C. Finish:

1. Galvanizing: Steel deck shall be galvanized with a protective zinc coating conforming to ASTM A653 G90.
2. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces complying with Department of Defense Specifications DOD-P-21035.

D. Fabrication:

1. General: Fabricate deck panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck", in SDI Publication No. 29, and the following.
2. Steel Deck Spans: Where possible, all steel deck shall extend over three or more supports. Single span deck is prohibited.

2.3 ACCESSORIES

A. Mechanical Fasteners:

1. Powder-Actuated or Pneumatically Driven Pins: Provide corrosion-resistant, powder-actuated or pneumatically driven fasteners manufactured from steel conforming to AISI 1060 or 1061 steel, austempered to a core hardness of 52 to 58 Rockwell C. Fasteners shall have a knurled shank and shall be zinc-plated in accordance with ASTM B633, Sc. I, Type III.
 - a. Subject to compliance with requirements, provide products of one of the following manufacturers:
 - 1) Hilti, Inc.
 - 2) ITWBuildex.
 - 3) Pneutek, Inc.
2. Self-Drilling Screw Fasteners: Provide corrosion-resistant, hexagonal head, steel self-drilling screws conforming to ASTM C1513[, with a surface hardness of not less than Rockwell C50 and a core hardness not less than Rockwell C32].
 - a. Subject to compliance with requirements, provide products of one of the following manufacturers:
 - 1) Hilti, Inc.
 - 2) ITWBuildex.
 - 3) Grabber Construction Products.
 - 4) SFS Intec Fastening Systems, Inc.
 - 5) Textron Fastening Systems.

B. Side-Lap Fasteners:

1. Provide corrosion-resistant, hexagonal washer head undercut with reverse serrations, self-drilling, carbon-steel screws, No. 10 minimum diameter.
 - a. Subject to compliance with requirements, provide products of one of the following manufacturers:
 - 1) Hilti, Inc.
 - 2) Other approved alternative.

C. Roof Deck Accessories:

1. Provide minimum 20 gauge ridge and valley plates, minimum 20 gauge cant strips, minimum 14 gauge sump pans, minimum 20 gauge inside or outside closure channels angles or plates, minimum 20 gauge butt strips at change of deck directions, and minimum 20 gauge filler sheets.
2. Provide a 20 gage galvanized flat plate to reinforce openings in roof deck that are greater than 6" and less than 10" in any one direction.

D. Composite/Form Deck Accessories:

1. Flexible Closure Strips: Provide manufacturers standard vulcanized closed cell, synthetic rubber.
2. Acoustic Sound Barrier Closures: Provide manufacturers standard mineral fiber closures.
3. Metal Cover Plates – Cellular Deck: Fabricate metal cover plates for end abutting floor deck units of not less than same thickness as decking, formed to match contour of deck units.
4. Cell Closure at Ends of Steel deck Flutes: Fabricate metal closure strips of not less than 0.0358" minimum (20 gage) cold formed sheet steel. Form to provide tight fitting cell closures at open ends of cells or flutes to prevent wet concrete from leaking through open cells.
5. Pour Stop Closures at Slab Edges: Provide sheet metal pour stop closures at all slab edges, columns, walls, and openings unless steel angles or bent plates are specified in details on the drawings. The closures shall be fabricated from light gage steel not less than the thickness shown below when the slab edge is parallel to the deck span. Provide a return lip on the vertical leg in accordance with the SDI Design Manual. The overhang dimension is measured from the edge of the flange to the edge of the slab.
 - a. Slab thickness = 5":
 - 1) Overhang between 0" and 2": 18 gage.
 - 2) Overhang between 2" and 4": 16 gage.
 - 3) Overhang between 4" and 6": 14 gage.
 - 4) Overhang between 6" and 8": 12 gage.
 - 5) Overhang between 8" and 10": 10 gage.
 - 6) Overhang greater than 10": Not acceptable as light gage.
 - b. Slab thickness = 6.5"
 - 1) Overhang between 0" and 2": 16 gage.
 - 2) Overhang between 2" and 4": 14 gage.
 - 3) Overhang between 4" and 8": 12 gage.
 - 4) Overhang greater than 8": Not acceptable as light gage.

E. Openings on Concrete Floor:

1. For unframed openings, provide blackout in slab for opening with deck uncut. Cut deck at opening after concrete has been poured and obtained 75% of its design strength. See Section 033000, "Cast-In-Place Concrete", 032000, "Concrete Reinforcing", for reinforcing in the slab around all unframed openings in steel deck that are greater than 10" width in either direction.

F. Extra Concrete Required for Deck Deflection

1. The General Contractor shall include in his bid additional concrete required for steel deck slabs to account for deck deflection.

2.4 CONCRETE SLAB REINFORCEMENT

- A. See drawings for reinforcement in composite and non-composite concrete slabs. See Section 033000, "Cast-in-Place Concrete", for minimum reinforcement requirements.

2.5 CHLORIDE ADMIXTURES

- A. The use of admixtures in concrete containing chloride salts shall not be permitted for steel deck concrete.

2.6 ROOF OPENINGS

- A. Provide a 20 gage galvanized flat plate to reinforce openings in roof deck that are greater than 6" and less than 10" in any one direction.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install deck units as accessories in accordance with manufacturers recommendations and approved shop drawings, and as specified herein:
 - 1. Place deck units on supporting framework and adjust to final position with ends accurately aligned and minimum bearing on supporting members indicated below before being permanently fastened. Do not stretch or contract side lap interlocks. Place the end joint over a chord angle for deck bearing on steel joists.
 - 2. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.
 - 3. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
 - 4. Do not place deck units on concrete supporting structure until concrete has cured and is dry.
 - 5. Do not use floor or roof deck units for storage or working platforms until permanently secured.
 - 6. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
 - 7. The Contractor is responsible for temporary deck fastening to meet OSHA requirements to use the floor deck unit as a storage or working platform before final attachment is installed.
- B. Deck Attachments: The deck shall be fastened to the structural support members using one of the following methods:
 - 1. Powder-Actuated Driven Pins:
 - a. An operator licensed by the manufacturer shall install all pins.

- b. Comply with the manufacturer's requirements to install the pins through all layers of the deck material and the manufacturer's required embedment into the supporting member.
2. Welding: Welds shall be puddle welds with diameters as indicated below. Where two deck units abut each other, each unit shall be so welded. Puddle welds may be replaced with welded shear connectors when applicable.
 - a. All welding shall be performed by AWS qualified welders unless otherwise approved by the building official.
 - b. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
 - c. Weld metal shall penetrate all layers of deck material at end laps and side joints and shall have good fusion to the supporting member.
 - d. Welding washers shall be used only when welding steel deck less than 0.028" thickness. Welding washers shall be a minimum thickness of 0.0568 inches and have a nominal 3/8" diameter hole.
3. Self-Drilling Fasteners: Comply with the manufacturer's requirements to install the screws through all layers of the deck material and the manufacturer's required embedment into the supporting member.
4. Attachment of Composite Deck:
 - a. Powder-Actuated Driven Pins: Refer to the drawings for type of pin used and number and spacing of attachments.
 - b. Welding: Steel deck units shall be welded to the structural support members with 5/8" diameter puddle welds at each end of sheet and each intermediate support at each low flute, unless more frequent attachment is specified on the drawings.
 - 1) Welding Washers: Welding washers shall be used when welding steel deck units less than 0.028" thickness.
 - c. Self-Drilling Fasteners may not be used for attachment of composite deck.
 - d. Attachment to Girders: Steel deck units shall be attached to girders (steel framing that is parallel to span of deck) using one of the specified fastening methods at a spacing of 12" center to center.
 - e. Side Laps: Unless noted otherwise on the drawings, side laps of adjacent units shall be fastened by welding (1-1/2 inch long), sheet metal screws (No. 10 or larger) or button punching at maximum intervals not exceeding the lesser of half of the span or 36".
 - f. Welding of Composite Deck used on Roof: In addition to the minimum attachment specified above, typical areas of the roof deck shall be welded to resist the net uplift pressures as specified in the General Notes on the drawings
 - g. Minimum Bearing: Provide a minimum deck bearing of 1 1/2" over all supports with butted end joints.
 - h. Cellular Decks: Keep the interiors of cells that will be used as raceways free of welds or screw edges having sharp points or edges.

5. Attachment of Roof Deck:
 - a. The method of attachment, attachment pattern, and side lap fastener type and spacing, shall be as shown on the drawings and comply with the requirements noted below.
 - b. Powder-Actuated or Pneumatically Driven Pins.
 - c. Self-Drilling Fasteners.
 - d. Side Lap Fastening: Unless required otherwise by provisions of Factory Mutual, Underwriters Laboratories, or this specification, side laps of adjacent units shall be fastened by welding (on 20 gauge or heavier deck only) or #10 (minimum) TEK screws so that spacing between supports and fasteners does not exceed the value prescribed on the drawings. Nest side laps one-half corrugation for form deck. Button punching is not allowable as a side-lap fastener.
 - e. End Bearing: Provide a minimum end bearing of 2" over supports.
 - f. End Joints: End joints of sheets shall be lapped 2" minimum over supports unless a more stringent requirement is specified by Factory Mutual or Underwriters Laboratory. Decks that slope 1/4 inch or more in 12 inches in the long direction shall be erected beginning at the low side to insure that end laps are shingle fashion.
 - g. Attachment to Girders: At locations noted in the drawings, attach the deck to steel members that are parallel to the deck flutes in accordance with the requirements noted in the drawings.
 - h. Attachment to Girders: At locations where the deck flutes are parallel to the span of the steel framing and the top of the framing is at the bottom of the deck elevation, the deck shall be attached to the girder using one of the specified fastening methods at 18 inches on center.
- C. Welding Requirements: Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking.
- E. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work.
 1. Roof Openings: Roof openings less than 6" square or diameter require no reinforcement. Opening 6" to 10" inclusive shall be reinforced with a 20 gauge galvanized plate welded to the deck at each corner and 6" maximum centers with a 5/8" diameter puddle weld or sheet metal screws. For openings greater than 10" in diameter or width, refer to the drawings and structural steel specifications for additional framing to support the deck around the opening.
- F. Hanger Slab or Clips: Provide UL approved punched hanger slots between cells or flutes of lower element where floor deck units are to receive hangers for support of ceiling construction, air ducts, diffusers or lighting fixtures.
 1. Hanger clips designed to clip over male side lap joints of floor deck units may be used instead of hanger slots.

2. Locate slots or clips at not more than 14" o.c. in both directions, not over 9" from walls at ends, and not more than 12" from walls at sides, unless otherwise shown.
 3. Provide manufacturer's standard hanger attachment devices.
 4. Loads hanging from steel deck slabs shall not exceed 100 pounds unless specifically detailed otherwise on the drawings.
- G. Joint Covers and Cell Closures: Weld steel sheet joint covers at abutting ends and at changes in direction of deck units, except where taped joints are specified. Weld steel sheet column closures, cell closures and Z-closures to deck with 1" long weld at 12" maximum centers to provide tight-fitting closures at open ends of ribs, unless shown otherwise on the drawings.
- H. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated. Provide minimum 2" bearing over steel support.
- I. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches apart with at least 1 weld in each corner.
- J. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
- 3.2 TOUCH-UP PAINTING
- A. After deck installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.
 - B. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.
 - C. Touch-up painted surfaces with same type of shop paint used on adjacent surfaces.
 - D. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.
- 3.3 FIELD QUALITY CONTROL
- A. Field Testing and Inspection: Refer to Specification 01 45 29 "Structural Testing and Inspections" for testing and inspection requirements associated with steel decking.

END OF SECTION 05 31 00

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SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior non-load-bearing wall framing.
2. Soffit framing.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for masonry shelf angles and connections.
2. Section 09 21 16.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
3. Section 09 22 16 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

B. Meet with Owner, Architect, testing and inspecting agency representative, metal framing Installer, Metal Framing Engineer, exterior sheathing Installer, and installers whose work interfaces with or affects cold-formed metal framing.

C. Review methods and procedures related to cold-formed metal framing installation, including those contained in metal framing engineer's delegated design submittal.

D. Review design loads imposed on building structure.

1. Review and clearly identify locations of interior and corner wind load zones of building façade.
2. Review design wind speeds and resulting positive and negative loads imposed on metal framing and exterior sheathing at interior zones and corner zones of building façade.
3. Review securement of system components required to withstand design wind loads, including the following:
 - a. Attachment of bottom track to floor structure, and type and spacing of fasteners.
 - b. Attachment of top track to overhead structure, and type and spacing of fasteners.
 - c. Attachment of studs to top and bottom tracks.
 - d. Attachment of vertical deflection clips to overhead structure.
 - e. Attachment of studs to vertical deflection clips.
 - f. Review required minimum edge clearance from edge of slab, and size, spacing, and required penetration of fasteners.

- E. Review size and location of exterior wall framing mockup.
- F. Review requirements and understanding of Field Quality Control article.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 3. Indicate exterior sheathing screw fastener spacing to be utilized at interior zones and corner zones of building façade, as required to ensure sheathing installation will withstand negative wind pressures imposed by design wind speeds.

1.4 INFORMATIONAL SUBMITTALS

- A. Delegated-Design Submittal: Engineering calculations for cold-formed steel framing, signed and sealed by Metal Framing Engineer.
- B. Qualification Data: For testing agency.
- C. Welding certificates.
- D. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.
- E. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.
- F. Field Quality Control:
 - 1. Photographic documentation of approved exterior wall framing mockup, in digital form. Include pan and close-up photos of the following:
 - a. Attachment of bottom track to floor structure.
 - b. Attachment of top track to overhead structure.
 - c. Attachment of studs to bottom track and top track/clips.
 - d. Attachment of vertical deflection clips to overhead structure.
 - e. Attachment of horizontal drift clips to overhead structure.
 - f. Attachment of studs to vertical deflection clips.

- g. Attachment of studs to horizontal drift clips.
 - h. Attachment of sheathing to studs.
2. Pre-Inspection Notification: Submit written report that work has been reviewed for compliance by Contractor, Installer, and Metal Framing Engineer, and is ready for inspection by Testing Agency.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- D. Mockups: Build mockups to verify quality standards for materials and execution, and to demonstrate compliance with structural performance criteria and delegated design submittals.
 - 1. Unless otherwise requested by Owner or Architect, build mockup of typical exterior non-load-bearing wall, one structural bay wide by one story high, at an outside corner.
 - 2. Include studs, top track, bottom track, sealer gasket, deflection clips and bridging.
 - 3. Cover approximately 25 percent of wall framing with specified sheathing. Include sheathing at outside corner.
 - 4. Mockup shall be reviewed by Metal Framing Engineer.
 - 5. Mockup will be inspected by testing and inspection agency.
 - 6. Provide photographic documentation of approved mockup.
 - 7. Subject to compliance with requirements, approved mockup may become part of the completed Work.

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CEMCO; California Expanded Metal Products Co.
 2. ClarkDietrich Building Systems.
 3. Marino\WARE.
 4. Nuconsteel, A Nucor Company.
 5. SCAFCO Corporation.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer (Metal Framing Engineer), as defined in Section 01 40 00 "Quality Requirements," to design cold-formed steel framing, including fasteners and connections to building structure.
- B. Structural Performance: Provide cold-formed steel framing members, connectors, and fasteners capable of withstanding design loads within limits and under conditions indicated.
1. Design Loads: As indicated on Structural Drawings.
 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Framing Behind Brick or Stone Masonry Veneer: Horizontal deflection of $L/600$ of the wall height in feet.
 - b. Framing Behind Metal Panels: Horizontal deflection of $L/360$ of the wall height in feet.
 - c. Soffit Framing: Vertical deflection of $1/120$ of the span for live loads and $1/240$ for total loads of the span.
 3. Wind Design: Per FM Data Sheet 1-28: Exterior wall components and cladding materials should be capable of withstanding the following wall pressures and incorporate a safety factor of 2.0 to the ultimate strength design:
 - a. Wall Zone 4 (field): Inward = 31.7 psf Outward = 33.7 psf
 - b. Wall Zone 5 (corner): Inward = 31.7 psf Outward = 39.6 psf
 - c. Calculated using a wind speed of 120 mph, ground roughness category C, importance factor of 1.15 and a partially enclosed building.
 4. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
 5. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1 inch (25 mm).

6. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Design Standards:
 1. Wall Studs: AISI S211.
 2. Headers: AISI S212.
 3. Lateral Design: AISI S213.
 - D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
 - E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- 2.3 COLD-FORMED STEEL FRAMING, GENERAL
- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 1. Grade: As required by structural performance.
 2. Coating: G60 (Z180)[**or equivalent**].
 - B. Steel Sheet for Vertical Deflection or Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 1. Grade: As required by structural performance.
 2. Coating: G60 (Z180).
- 2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING
- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: As required by design and performance requirements, but not less than 0.0538 inch (1.37 mm).
 2. Flange Width: As required by design and performance requirements, but not less than 1-5/8 inches (41 mm).
 3. Stud Depth: 6 inches (152.4 mm) unless otherwise indicated or required to comply with span and deflection design criteria.
 - B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: As required by design and performance requirements, but not less than 0.0538 inch (1.37 mm).
 2. Flange Width: As required by design and performance requirements, but not less than 1-1/4 inches (32 mm).
 - C. Slip-Type Head Joints for Vertical Deflection: Provide one of the following:

1. Proprietary Vertical Deflection Clips: Manufacturer's proprietary head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) ClarkDietrich Building Systems; "Fast Top Clip", 0.0677 inch (1.72 mm), used in conjunction with minimum 0.033 inch (0.8 mm) deep leg track.
 - 2) MarinoWARE; DEFLEX slide clips, used in conjunction with minimum 0.033 inch (0.8 mm) deep leg track.
 - 3) SCAFCO Corporation, Deflection Clips ESC or DESC.
 - 4) Steel Network, Inc. (The); VertiClip SL Series, or VertiTrack VTX Series (0.0677 inch (1.72 mm), used in conjunction with minimum 0.033 inch (0.8 mm) deep leg track).
 2. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
 - a. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - 1) Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
 - 2) Flange Width: As required by design.
 - b. Inner Track: Of web depth indicated, and as follows:
 - 1) Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
 - 2) Flange Width: As required by design.
 3. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.
- D. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.
- 2.5 SOFFIT FRAMING
- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
 2. Flange Width: as indicated on drawings.
- 2.6 FRAMING ACCESSORIES
- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
1. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 3/4 inch (19 mm), minimum base-steel thickness of 0.0538 inch (1.37 mm), and depth required to fit insulation thickness or as indicated on Drawings.

- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Gusset plates.
 - 8. Stud kickers and knee braces.
 - 9. Hole reinforcing plates.
 - 10. Backer plates.

2.7 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating

agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.

- D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.9 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and fastener penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 07 21 00 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
 1. Bottom Tracks: Secure to concrete with expansion anchors or power-actuated anchors.
 2. Outer Track of Double Deflection Top Tracks:
 - a. Secure to concrete with expansion anchors only; power-actuated anchors will not be permitted.
 - b. Secure to structural steel with power-actuated anchors.
- B. Fasten both flanges of studs to bottom track unless otherwise indicated. Space studs as follows:
 1. Stud Spacing: As required by design, but not greater than 16 inches (406 mm) on center.
 2. Decrease spacing between studs (or increase minimum base-metal thickness) where required to ensure cold-formed metal framing system installation will withstand positive and negative wind pressures imposed by design wind speeds, as indicated in Shop Drawings.
- 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. At Contractor's option, provide one of the following:
 - a. Connect proprietary vertical deflection track/clips to studs and anchor to building structure in accordance with manufacturer's instructions.
 - b. Install double deep-leg deflection tracks and anchor outer track to building structure.
 2. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
 1. At Contractor's option, provide one of the following:
 - a. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

- b. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 SOFFIT INSTALLATION

- A. Install perimeter soffit 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 soffit framing 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 soffit framing over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).
- C. Space soffit framing not more than 2 inches (51 mm) from abutting walls, and as follows:
 - 1. Soffit Framing Spacing: As required by design, but not greater than 16 inches (406 mm) on center.
- D. Frame openings with built-up framing.
- E. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each framing intersection as follows:
 - 1. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and framing-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- F. Install miscellaneous framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable framing assembly.

3.6 FIELD QUALITY CONTROL

- A. Testing: Owner reserves the right to engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Submit written report that work has been reviewed for compliance by Contractor, Installer, and Metal Framing Engineer, and is ready for inspection by Testing Agency.
- C. The following items will be subject to testing and inspecting:
 - 1. Field and shop welds.
 - 2. Attachment of bottom track to floor structure, including the following:
 - a. Spacing of fasteners.
 - b. Edge clearance.

- c. Embedment / penetration of fasteners.
 3. Attachment of top track to overhead structure, including the following:
 - a. Spacing of fasteners.
 - b. Edge clearance.
 - c. Embedment / penetration of fasteners.
 4. Attachment of studs to bottom track and top track/clips.
 5. Attachment of vertical deflection clips to overhead structure, including the following:
 - a. Edge clearance.
 - b. Embedment / penetration of fasteners.
 6. Attachment of horizontal drift clips to overhead structure, including the following:
 - a. Edge clearance.
 - b. Embedment / penetration of fasteners.
 7. Attachment of studs to vertical deflection clips.
 8. Attachment of studs to horizontal drift clips.
 9. Installation of bridging and bracing.
- D. Testing agency will report test results promptly and in writing to Contractor, Architect, and Metal Framing Engineer.
- E. Inspection Frequency:
 1. Owner and Architect will select approximately 20 random locations, roughly 12 to 15 feet wide by one story high, to be inspected by Testing Agency. Testing Agency will inspect the following at each location:
 - a. Top and Bottom Track:
 - 1) Each lineal foot of bottom track to structure.
 - 2) Each lineal foot of outer track (of double deflection track) to structure.
 - b. Studs:
 - 1) Attachment of each stud to bottom track.
 - 2) Attachment of each stud to inner track of double deflection track.
 - 3) Attachment of each vertical deflection clip to structure.
 - 4) Attachment of each horizontal drift clip to structure.
 - 5) Attachment of each stud to vertical deflection clip.
 - 6) Attachment of each stud to horizontal drift clip.
 2. If inspections reveal repeat deficiencies or a pattern of noncompliance with requirements, as determined by the Owner, Architect, and Testing Agency, work of this Section for the entire balance of the project will be inspected by the Testing Agency at the Contractor's expense.
- F. Remove and replace work where inspections indicate that it does not comply with specified requirements. Do not cover or conceal corrected work until it has been reinspected for compliance with requirements.
- G. 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 that 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 SUMMARY

A. Section Includes:

1. Steel framing and supports for countertops.
2. Steel tube reinforcement for low partitions.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Steel pipe columns for supporting wood frame construction.
6. Slotted channel framing.
7. Metal ladders.
8. Prefabricated crossover stairs.
9. Elevator pit sump covers.
10. Structural-steel door frames.
11. Miscellaneous steel trim including steel angle corner guards and loading-dock edge angles.

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

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 04 20 00 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
2. Section 05 12 00 "Structural Steel Framing" for steel framing, supports, elevator machine beams, hoist beams, divider beams, door frames, and other steel items attached to the structural-steel framing.
3. Section 07 72 00 "Roof Accessories" for manufactured metal roof walkways and metal roof stairs.

1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 2. Fasteners.
 - 3. Shop primers.
 - 4. Shrinkage-resisting grout.
 - 5. Slotted channel framing.
 - 6. Manufactured metal ladders.
 - 7. Metal bollards.
 - 8. Prefabricated crossover stairs.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
 - 1. Steel framing and supports for countertops.
 - 2. Steel tube reinforcement for low partitions.
 - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 4. Metal ladders.
 - 5. Prefabricated crossover stairs.
 - 6. Elevator pit sump covers.
 - 7. Miscellaneous steel trim including steel angle corner guards and loading-dock edge angles.
 - 8. Metal bollards.
 - 9. Loose steel lintels.

1.4 Delegated-Design Submittal: For specified items, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.
- B. Research Reports: For post-installed anchors.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design the following:
 - 1. Design Calculations: Submit design calculations for the following:
 - a. Countertop support framing.
 - b. Partial height partitions.
- B. Supports for Countertops:
 - 1. Dead load of counters.
 - 2. Uniform Load: 50 pounds per linear foot of counter.
 - 3. Concentrated Load Downward: 200 pounds at any point on the counter.
 - 4. Limit deflection to L/360 between supports.
- C. Support for Partial Height Partitions:
 - 1. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - 2. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Deflection of L/240.

- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

- 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- D. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- E. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
- F. Zinc-Coated Steel Wire Rope: ASTM A741.
 - 1. Wire Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
- G. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches.
 - 2. Material: Galvanized steel, ASTM A653/A653M, structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.
 - 3. Material: Cold-rolled steel, ASTM A1008/A1008M, structural steel, Grade 33; 0.0966-inch minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.
- H. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless steel fasteners for fastening stainless steel.
 - 2. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.
- D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.
- E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
- G. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.
- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.
- I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 09 91 23 "Interior Painting," and Section 09 96 00 "High-Performance Coatings."
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- D. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.

2. Furnish inserts for units installed after concrete is placed.
- C. Partial-Height Partition Supports: At Contractor's Option provide one of the following:
 1. Fabricate supports for partial height partition supports from steel shapes of size required to limit the specified deflection with attached bearing plates, anchors, and braces.
 2. Manufactured minimum 14 gage steel tube and 3/8-inch thick steel base plate assembly, of height required to brace less than full-height, free-standing gypsum board partitions, with pre-punched holes for attachment or anchorage to concrete subfloor substrate.
 - a. Acceptable Products:
 - 1) MidWall as manufactured by Steel Network MidWall
 - 2) NoFlex Corporation, Huntington Beach, CA.
 - 3) Pony Wall (PW) as manufactured by Clark Dietrick.
- D. Galvanize miscellaneous framing and supports where indicated.
- E. Prime miscellaneous framing and supports with primer specified in Section 09 96 00 "High-Performance Coatings" where indicated.

2.7 METAL LADDERS

- A. General:
 1. Comply with ANSI A14.3, except for elevator pit ladders.
 2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
- B. Steel Ladders:
 1. Space siderails 16 inches apart unless otherwise indicated.
 2. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
 3. Rungs: 3/4-inch-diameter, steel bars.
 4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
 5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
 6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Harsco Industrial IKG, a division of Harsco Corporation.
 - 2) ROSS TECHNOLOGY CORP.
 - 3) W.S. Molnar Company.
 7. Source Limitations: Obtain nonslip surfaces from single source from single manufacturer.
 8. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2 inch in least dimension.

9. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
10. Galvanize ladders, including brackets.
11. Prime exterior ladders, including brackets and fasteners, with primer specified in Section 09 96 00 "High-Performance Coatings."

C. Aluminum Parapet Ladder with Platform:

1. Basis-of-Design Product: O'Keeffe's, Inc.; Tubular Rail High Parapet Access Ladder with Platform and Return (Model 503) or comparable product approved by the Architect.
2. Materials:
 - a. Aluminum Sheet: Alloy 5005-H34 per ASTM B209.
 - b. Aluminum Extrusions: Alloy 6063-T6 per ASTM B221.
3. Finish: Mill.
4. Rungs: Not less than 1-1/4 inches in section and 18-3/8 inches long, formed from tubular aluminum extrusions. Squared and deeply serrated on all sides.
5. Heavy Duty Tubular Side Rails: Assembled from two interlocking aluminum extrusions no less than 1/8 inch wall thickness by 3 inches wide. Construction shall be self-locking stainless steel fasteners, full penetration TIG welds and clean, smooth and burr-free surfaces.
6. Landing Platform: 1-1/2 inches or greater diameter, tubular aluminum guardrails and decks of serrated aluminum treads.

2.8 PREFABRICATED CROSSOVER STAIRS

- A. Basis-of-Design Product: PHP Systems/Design; Crossover System or comparable product approved by the Architect in configuration shown on Drawings.
 1. Frame Material: Carbon Steel with hot dip galvanized finish per ASTM A 123.
 2. Bar Grating height: 1-inch.
 3. Surface: Serrated.

2.9 ELEVATOR PIT SUMP COVERS

- A. Fabricate from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 1/2 inch in least dimension.
- B. Provide steel angle supports unless otherwise indicated.

2.10 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

2.11 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.

C. Galvanize and prime loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with primer specified in Section 09 96 00 "High-Performance Coatings."

2.12 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.13 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless primers specified in Section 09 96 00 "High-Performance Coatings" are indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Primers Specified in Section 09 96 00 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
4. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for ceiling hung toilet partitions, operable partitions and overhead doors securely to, and rigidly brace from, building structure.
- C. Anchor shelf angles securely to existing construction with anchor bolts.

3.3 INSTALLATION OF METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
 - 1. Do not fill removable bollards with concrete.
- B. Anchor bollards to existing construction with anchor bolts. Provide four 3/4-inch bolts at each bollard unless otherwise indicated.
 - 1. Embed anchor bolts at least 4 inches in concrete.
- C. Anchor bollards in concrete in formed or core-drilled holes not less than 42 inches deep and 3/4 inch larger than OD of bollard. Fill annular space around bollard solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.
- D. Fill bollards solidly with concrete, mounding top surface to shed water.

3.4 REPAIRS

- A. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
 - 2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 96 00 "High-Performance Coatings."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 05 51 36

METAL CATWALKS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Metal plate and diamond plate used to fabricate catwalks.
 - 2. Handrail system anchored to catwalk.

1.2 ACTION SUBMITTALS

- A. Product data for steel bar gratings, stair treads, perimeter frames and fasteners.
- B. Shop Drawings: Show fabrication and installation details for metal catwalks. Include plans, elevations, sections, and details of metal catwalks and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
- C. Delegated-Design Submittal: For catwalks, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

- A. 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.
- B. Welding Certificates: Copies of certificates for welding procedures and personnel.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Arrange for metal catwalks specified in this Section to be fabricated and installed by the same firm.
- B. Fabricator Qualifications: A firm experienced in producing metal catwalks 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.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.5 COORDINATION

- A. Coordinate installation of anchorages for metal catwalks. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal catwalks, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance of Catwalks: Metal catwalks shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
 - 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 - 5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.
- C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS

- A. Metal Surfaces, General: Provide metal free from pitting, seam marks, roller marks, and other imperfections where exposed to view on finished units. Do not use steel sheet with variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.
- B. Tubing: ASTM A 500 (cold formed) or ASTM A 513.

- C. 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.
- D. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- E. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- D. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).
- E. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor catwalks 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 to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. 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 and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.6 STEEL-FRAMED PLATFORMS

A. Form platforms to configurations shown from metal plate.

1. Provide toeplates at open-sided edges of platforms. Weld steel plate to platform framing.

2.7 RAILINGS

A. Steel Pipe Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

B. Welded Connections: Fabricate railings with 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. Form changes in direction of railings as follows:

1. By bending or by inserting prefabricated elbow fittings.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

E. Close exposed ends of railing members with prefabricated end fittings.

F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

G. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.8 FINISHES

A. Comply with NAAMM'S "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Finish metal stairs after assembly.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.
- C. Install metal catwalks by welding catwalk framing to steel structure.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
- F. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 INSTALLING RAILINGS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
 - 1. Anchor posts to steel by welding directly to steel supporting members.

END OF SECTION

SECTION 05 73 00

DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Illuminated stainless steel handrails.
 - 2. Stainless steel guardrails

1.2 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Illuminated stainless steel handrails.
 - 2. Nonshrink, nonmetallic grout.
- B. Shop Drawings: Include plans, full elevations, sections and details as required to show all materials, layout, dimensions, jointing and connections for all items required.
- C. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Submit complete shop drawings of all decorative metal railing work. Shop drawings requiring accurate dimensional relationships to newly built construction shall be prepared following a review and confirmation of existing conditions to remain. Prepare shop drawings based on surveyed line and grade of newly built or as-built conditions that are scheduled to receive decorative metal railings.
- D. Samples- For each type of exposed finish required.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For delegated-design professional engineer.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockups as shown on Drawings.
 - 2. Build mockups for each form and finish of railing, consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on laboratory mockups. Payment for these services will be made by Contractor. Retesting of products that fail to meet specified requirements shall be done at Contractor's expense.
 - 1. Build laboratory mockups at testing agency facility; use personnel, materials, and methods of construction that will be used at Project site.
 - 2. Test railings in accordance with ASTM E894 and ASTM E935.
 - 3. Notify Architect seven days in advance of the dates and times when laboratory mockups will be tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
 - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of

joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

2.3 MISCELLANEOUS MATERIALS

- A. Illuminated stainless steel handrail: Basis of Design- Wagner Lumenpod 28, or architect approved equal.
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.4 FABRICATION

- A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
 1. Clearly mark units for reassembly and coordinated installation.
 2. Use connections that maintain structural value of joined pieces.
- C. Form work true to line and level with accurate angles and surfaces.
- D. Fabricate connections that will be exposed to weather in a manner to exclude water.
 1. Provide weep holes where water may accumulate.
 2. Locate weep holes in inconspicuous locations.
- E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- F. Connections: Fabricate railings with welded connections unless otherwise indicated.
- G. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove flux immediately.

4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.

H. Form changes in direction as follows:

1. By radius bends of radius indicated.

I. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

J. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, handrail brackets, miscellaneous fittings, and anchors to interconnect railing members to other Work unless otherwise indicated.

K. Provide inserts and other anchorage devices for connecting railings to concrete or masonry Work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

L. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.6 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 1. Run grain of directional finishes with long dimension of each piece.
 2. When polishing is completed, passivate and rinse surfaces.
 3. Remove embedded foreign matter and leave surfaces chemically clean.
- C. Stainless Steel Tubing Finishes:
 1. 180-Grit Polished Finish: Uniform, directionally textured finish.
- D. Stainless Steel Sheet and Plate Finishes:
 1. Directional Satin Finish: ASTM A480/A480M, No. 4.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
 - 1. Fit exposed connections together to form tight, hairline joints.
 - 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 - 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 - 4. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 6. 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. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. Coat concealed surfaces of that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

3.3 ANCHORING POSTS

- A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

- B. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For stainless steel railings, weld flanges to posts and bolt to metal-supporting surfaces.

3.4 ATTACHING RAILINGS

- A. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made from the testing and inspecting allowance, as authorized by Change Orders.
- B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings in accordance with ASTM E894 and ASTM E935 for compliance with performance requirements.
- C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and comply with specified requirements.
- D. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.6 CLEANING

- A. Clean stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.
- B. Clean wood rails by wiping with a damp cloth and then wiping dry.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 06 10 53

MISCELLANEOUS CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Rooftop equipment bases and support curbs.
 - 3. Wood blocking and nailers.
 - 4. Wood furring.
 - 5. Plywood backing panels.
- B. Related Requirements:
 - 1. Section 06 16 00 "Sheathing" for sheathing.

1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
- B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 - 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 - 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - 4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664, and design value adjustment factors shall be calculated according to ASTM D6841
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
 - 1. Application: Treat all miscellaneous carpentry used within the building envelope.

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. Furring.
 4. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any species.
 5. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- B. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- C. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.
- 2.5 PLYWOOD BACKING PANELS
- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.
- 2.6 FASTENERS
- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Screws for Fastening to Metal Framing: ASTM C1002 or ASTM C954, length as recommended by screw manufacturer for material being fastened.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193, or ICC-ES AC308 as appropriate for the substrate.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
 2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
 - C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
 - D. Do not splice structural members between supports unless otherwise indicated.
 - E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
 - F. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
 - G. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
 - H. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 2. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- 3.2 INSTALLATION OF WOOD BLOCKING AND NAILER
- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
 - B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- 3.3 INSTALLATION OF WOOD FURRING
- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- 3.4 PROTECTION
- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered

borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

- B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 16 00

SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Carpentry" for plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

B. Shop Drawings: For air-barrier and water-resistant glass-mat gypsum sheathing assemblies.

1. Show locations and extent of sheathing, accessories, and assemblies specific to Project conditions.

2. Include details for sheathing joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

3. Include details of interfaces with other materials that form part of air barrier.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer of air-barrier and water-resistant glass-mat gypsum sheathing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WALL SHEATHING

- A. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Continental Building Products, LLC.
 - c. Georgia-Pacific Gypsum LLC.
 - d. National Gypsum Company.
 - e. USG Corporation.
 - 2. Type and Thickness: Type X, 5/8 inch thick.

2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
 - 1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C1002.
 - 2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C954.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
- D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
 - 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

END OF SECTION

SECTION 06 20 13
EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lumber soffits.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Carpentry" for furring, blocking, and other carpentry work not exposed to view.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

B. Samples: For each exposed product and for each color and texture specified.

C. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

1.3 INFORMATIONAL SUBMITTALS

A. Compliance Certificates:

1. For lumber that is not marked with grade stamp.

B. Sample Warranties: For manufacturer's warranties.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.

1. Protect materials from weather by covering with waterproof sheeting, securely anchored.

2. Provide for air circulation around stacks and under coverings.

1.5 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 LUMBER SOFFITS

- A. Provide kiln-dried lumber siding complying with DOC PS 20.
- B. Species and Grade: Northern white cedar; NeLMA or NLGA D Select.
- C. Pattern: V-edge, smooth-faced tongue and groove, actual face width (coverage) and thickness of 5-1/8 by 23/32 inch.

2.2 MISCELLANEOUS MATERIALS

- A. Rain Screen Clips: 2 inch wide marine grade aluminum alloy rain screen siding clips and stainless steel screws.
 1. Product: Provide Climate-Shield CS-a, or equal as approved by Architect.
<http://www.mataverdedecking.com/architectural-specifications>

2.3 FABRICATION

- A. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials.
 - 1. Use concealed shims where necessary for alignment.
 - 2. Scribe and cut exterior finish carpentry to fit adjoining work.
 - 3. Refinish and seal cuts as recommended by manufacturer.
 - 4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 5. Coordinate exterior finish carpentry with materials and systems in or adjacent to it.
 - 6. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.
 - 7. ADJUSTING
 - C. Replace exterior finish carpentry that is damaged or does not comply with requirements.
 - 1. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
 - D. Adjust joinery for uniform appearance.
- 3.4 CLEANING
- A. Clean exterior finish carpentry on exposed and semiexposed surfaces.
- 3.5 PROTECTION
- A. Protect installed products from damage from weather and other causes during construction.
 - B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 06 40 23

INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Closet and utility shelving.
2. Built-in woodwork at the Speakeasy.
3. Wood furring, blocking, shims, and hanging strips for installing interior architectural woodwork items that are not concealed within other construction.
4. Shop finishing of interior architectural woodwork.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Carpentry" for wood furring, blocking, shims, and hanging strips required for installing interior architectural woodwork that are concealed within other construction before interior architectural woodwork installation.

1.2 COORDINATION

- ###### A.
- Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that interior architectural woodwork can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Anchors.
2. Adhesives.
3. Shop finishing materials.

B. Shop Drawings:

1. Include the following:
 - a. Dimensioned plans, elevations, and sections.
 - b. Attachment details.
2. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.

C. Samples for Verification: For the following:

1. Veneer Leaves: Representative of and selected from flitches to be used for transparent-finished interior architectural woodwork.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For architectural woodwork manufacturer and Installer.
- B. Product Certificates: For the following:
 - 1. Composite wood products.
 - 2. Adhesives.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
 - 1. Installer Qualifications: Manufacturer of products.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with the Architectural Woodwork Standards, Section 2.
- B. Do not deliver interior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas.
- C. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
 - 1. Handle and store fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions.

1.7 FIELD CONDITIONS

- A. Environmental Limitations with Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.
- B. Field Measurements: Where interior architectural woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOODWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

2.2 MATERIALS

- A. WV, Wood Veneer: Refer to Finish Schedule for selected material.
- B. Furring, Blocking, Shims, and Nailers: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
 - 1. Fire-Retardant Treatment: Complying with requirements; provide where indicated.
- C. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.
- D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.
 - 1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
- E. Installation Adhesive: Product recommended by fabricator for each substrate for secure anchorage.
 - 1. Verify adhesives have a VOC content of 70 g/L or less.
- F. Cleats: 3/4-inch solid lumber.
- G. Metal Closet Rods: 1-5/16-inch- diameter, aluminum tubes complying with BHMA A156.16, L03131.
- H. Metal Rod Flanges: Aluminum.

2.3 FABRICATION

- A. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.
 - 1. Disassemble components only as necessary for shipment and installation.
 - 2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
 - 3. Notify Architect seven days in advance of the dates and times interior architectural woodwork fabrication will be complete.

2.4 SHOP FINISHING

- A. Finish interior architectural woodwork indicated on Drawings at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.

- B. Preparation for Finishing: Comply with Architectural Woodwork Standards, Section 5 for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.
- C. Transparent Finish:
 - 1. Architectural Woodwork Standards Grade: Same as item to be finished.
 - 2. Finish System - 5: Varnish, Conversion.
 - 3. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter in accordance with ASTM D523.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition interior architectural woodwork to humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.
- B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

3.2 INSTALLATION

- A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.
- B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.
- C. Install interior architectural woodwork level, plumb, true in line, and without distortion.
 - 1. Shim as required with concealed shims.
 - 2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates.
 - 1. Secure with countersunk, concealed fasteners and blind nailing.
 - 2. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with interior architectural woodwork.
 - 3. For shop-finished items, use filler matching finish of items being installed.

3.3 REPAIR

- A. Repair damaged and defective interior architectural woodwork, where possible, to eliminate functional and visual defects.

- B. Where not possible to repair, replace defective woodwork.
- C. Shop Finish: Touch up finishing work specified in this Section after installation of interior architectural woodwork.
 - 1. Fill nail holes with matching filler where exposed.

3.4 CLEANING

- A. Clean interior architectural woodwork on exposed and semiexposed surfaces.

END OF SECTION

SECTION 06 41 16

PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.

1.2 ACTION SUBMITTALS

A. Product Data: high-pressure decorative laminate and cabinet hardware and accessories.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.
4. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Initial Selection:

1. Plastic laminates.

D. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.
2. Wood-grain plastic laminates, 12 by 24 inches, for each type, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.
3. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.3 INFORMATIONAL SUBMITTALS

- A. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups of one typical upper cabinet and one typical base cabinet.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide certificates from AWI certification program indicating that woodwork complies with requirements of grades specified.
 - 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Premium.
- C. Type of Construction: Frameless.
- D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- E. Reveal Dimension: As indicated in drawings.
- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Abet Laminati, Inc.
 - b. Formica Corporation.
 - c. Lamin-Art, Inc.
 - d. Pionite: a Panolam Industries International, Inc. brand.
 - e. Wilsonart International Holdings, Inc.
- G. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Vertical Surfaces: Grade HGS.
 - 3. Edges: Grade HGS.
 - 4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
 - 5. Drawer Sides and Backs: Solid-hardwood lumber.
 - 6. Drawer Bottoms: Hardwood plywood.
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated by laminate manufacturer's designations.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 1. Wood Moisture Content: 4 to 9 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
- C. Composite Wood Products: Products shall be made without urea formaldehyde.
 1. Medium-Density Fiberboard: ANSI A208.2.
 2. Particleboard: ANSI A208.1.
 3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100
 1. Grass America; G393.
 2. Salice; Series 200.
 3. Blum; Clip Top Press-In 71T6580
- B. Continuous piano hinges:
 1. Larsen.
 2. Stanley.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Adjustable Shelf Standards and Supports:
 1. Knappe and Vogt (standards and support clips) BHMA A156.9, B04071; with shelf rests, B04081:
 - a. Standards: 255E, zinc coated steel standards.
 - b. Shelf supports: 256R ZC, zinc coated steel standards with rubber cushion.
- E. Drawer Slides: BHMA A156.9.
 1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.
 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 3. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
 - a. Accuride 7432.
 4. File Drawer Slides: Grade 1HD-100; for drawers more than 6 inches high or 24 inches wide.
 - a. Accuride 4034.

5. Trash Bin Slides: Grade 1HD-100; for trash bins not more than 20 inches high and 16 inches wide.
 - F. Door Locks: BHMA A156.11, E07121.
 1. Corbin: 0737 lock with 12-S and 2540 strikes.
 2. Yale: 9780 lock with related strikes.
 3. Timberline Lock, Ltd.: CB-290.
 - G. Drawer Locks: BHMA A156.11, E07041.
 1. Knappe and Vogt: 986 lock.
 2. Timberline Lock, Ltd.: CB-280.
 - H. Toe Kick for ADA Sink Base doors:
 1. "Quick Toe" by Moore Technologies, Inc.
 - I. Door and Drawer Silencers: BHMA A156.16, L03011.
 1. Satin Stainless Steel: BHMA 630.
 - J. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.
- 2.4 MISCELLANEOUS MATERIALS
- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
 - B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
 - C. Adhesives: Do not use adhesives that contain urea formaldehyde.
 - D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 1. Adhesive for Bonding Edges: Hot-melt adhesive.
- 2.5 FABRICATION
- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
 - B. Fabricate cabinets to dimensions, profiles, and details indicated.
 - C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as

intended and check measurements of assemblies against field measurements before disassembling for shipment.

- D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1. Use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.

- C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION

SECTION 07 11 13

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-applied, emulsified-asphalt dampproofing.

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for bituminous vapor retarders under slabs-on-grade.

1.2 ACTION SUBMITTALS

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

1.3 FIELD CONDITIONS

- ###### A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
- ###### B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- ###### A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide protection course and auxiliary materials recommended in writing by manufacturer of primary materials.

2.2 PERFORMANCE REQUIREMENTS

- ###### A. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise indicated.

2.3 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- ###### A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. APOC, Inc; a division of Gardner Industries.
 2. BASF Corporation; Construction Systems.

3. Brewer Company (The).
 4. ChemMasters, Inc.
 5. Euclid Chemical Company (The); an RPM company.
 6. Henry Company.
 7. Karnak Corporation.
 8. Mar-flex Waterproofing & Building Products.
 9. W. R. Meadows, Inc.
- B. Trowel Coats: ASTM D 1227, Type II, Class 1.
- C. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
- D. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.4 AUXILIARY MATERIALS

- A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- C. Patching Compound: Epoxy or latex-modified repair mortar of type recommended in writing by dampproofing manufacturer.
- D. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.
1. Thickness: Nominal 1/8 inch.
 2. Adhesive: Rubber-based solvent type recommended in writing by waterproofing manufacturer for protection course type.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for surface smoothness, maximum surface moisture content, and other conditions affecting performance of the Work.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for dampproofing application.
- B. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

- C. Clean substrates of projections and substances detrimental to dampproofing work; fill voids, seal joints, and remove bond breakers if any.
- D. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless otherwise indicated.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
 - 1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where indicated as "reinforced," by embedding an 8-inch-wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
- C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
 - 1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
 - 2. Lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.
- D. Where dampproofing interior face of above-grade, exterior concrete and masonry walls, continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by dampproofing wall before constructing intersecting walls.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat.
- B. Interior Face of Single-Wythe Exterior Masonry Walls: Where above grade and indicated to be furred and finished, apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft.

3.5 PROTECTION COURSE INSTALLATION

- A. Install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.

1. Support protection course over cured coating with spot application of adhesive type recommended in writing by protection-board manufacturer.
2. Install protection course on same day of dampproofing installation (while coating is tacky) to ensure adhesion.

3.6 PROTECTION

- A. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where panels are subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- B. Correct dampproofing that does not comply with requirements; repair substrates, and reapply dampproofing.

END OF SECTION

SECTION 07 16 16
CRYSTALLINE WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Crystalline waterproofing (Used at escalator and elevator pits).

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for concrete slabs serving as protective topping for waterproofing and the finishing of concrete walls and slabs to receive waterproofing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and installation instructions.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Applicator.

B. Product Certificates: For each type of waterproofing, patching, and plugging material.

C. Product Test Reports: For each product formulation, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: A firm experienced in applying crystalline waterproofing similar in material, design, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

1.5 FIELD CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit crystalline waterproofing to be performed according to manufacturer's written instructions.

B. Proceed with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed. Proceed only after substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.

- C. Ambient Conditions: Proceed with waterproofing work only if temperature is maintained at 40 deg F or above during work and cure period, and space is well ventilated and kept free of water.

PART 2 - PRODUCTS

2.1 WATERPROOFING MATERIALS

- A. Crystalline Waterproofing: Prepackaged, gray-colored proprietary blend of portland cement, specially treated sand, and active chemicals that, when mixed with water and applied, penetrates into concrete and concrete unit masonry and reacts chemically with the byproducts of cement hydration in the presence of water to develop crystalline growth within substrate capillaries to produce an impervious, dense, waterproof substrate; with properties complying with or exceeding the criteria specified below.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anti-Hydro International, Inc.
 - b. AQUAFIN, Inc.
 - c. BASF Corporation.
 - d. Conproco Corporation.
 - e. Euclid Chemical Company (The); an RPM company.
 - f. Gemite Products Inc.
 - g. ICS Penetron International Ltd.
 - h. International Chem-Crete, Inc.
 - i. IPA Systems, Inc.
 - j. KOSTER American Corporation.
 - k. Kryton International Inc.
 - l. Xypex Chemical Corporation.
 - 2. Water Permeability: Maximum zero for water at 30 feet when tested according to COE CRD-C 48.
 - 3. Compressive Strength: Minimum 4000 psi at 28 days when tested according to ASTM C109/C109M.

2.2 ACCESSORY MATERIALS

- A. Patching Compound: Factory-premixed cementitious repair mortar, crack filler, or sealant recommended by waterproofing manufacturer for filling and patching tie holes, honeycombs, reveals, and other imperfections; and compatible with substrate and other materials indicated.
- B. Plugging Compound: Factory-premixed cementitious compound with hydrophobic properties and recommended by waterproofing manufacturer; resistant to water and moisture but vapor permeable for all standard applications (vertical, overhead, and horizontal surfaces not exposed to vehicular traffic); and compatible with substrate and other materials indicated.
- C. Water: Potable.

2.3 MIXES

- A. Crystalline Waterproofing: Add prepackaged dry ingredients to water according to manufacturer's written instructions. Mix together with mechanical mixer or by hand to required consistency.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for suitable conditions where waterproofing is to be applied.
- B. Proceed with application only after unsatisfactory conditions have been corrected.
- C. Notify Architect in writing of active leaks or defects that would affect system performance.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions.
- B. Protect other work from damage caused by cleaning, preparation, and application of waterproofing. Provide temporary enclosure to confine spraying operation and to ensure adequate ambient temperatures and ventilation conditions for application.
- C. Do not allow waterproofing, patching, and plugging materials to enter reveals or annular spaces intended for resilient sealants or gaskets, such as joint spaces between pipes and pipe sleeves.
- D. Stop active water leaks with plugging compound.
- E. Repair damaged or unsatisfactory substrate with patching compound.
 - 1. At holes and cracks 1/16 inch wide or larger in substrate, remove loosened chips and cut reveal with sides perpendicular to surface, not tapered, and minimum 1 inch deep. Fill reveal with patching compound flush with surface.
- F. Surface Preparation: Remove efflorescence, chalk, dust, dirt, mortar spatter, grease, oils, paint, curing compounds, and form-release agents to ensure that waterproofing bonds to surfaces.
 - 1. Clean concrete surfaces according to ASTM D4258.
 - a. Scratch- and Float-Finished Concrete: Etch with 10 percent muriatic acid solution according to ASTM D4260.
 - b. Smooth-Formed and Trowel-Finished Concrete: Prepare by mechanical abrading or abrasive-blast cleaning according to ASTM D4259.
 - 2. Concrete Joints: Clean reveals.

3.3 INSTALLATION

- A. Comply with waterproofing manufacturer's written instructions for application and curing.
 - 1. Saturate surface with water for several hours and maintain damp condition until applying waterproofing. Remove standing water.

2. Apply waterproofing to surfaces, and extend waterproofing onto adjacent surfaces as follows:
 - a. Onto columns integral with treated walls.
 - b. Onto interior nontreated walls intersecting exterior treated walls, for a distance of 24 inches for cast-in-place concrete.
 - c. Onto every substrate in areas indicated for treatment, including elevator pits and sumps and similar offsets and features.
 3. Number of Coats: Number required for specified water permeability.
 4. Application Method: Apply to ensure that each coat fills voids and is in full contact with substrate or previous coat.
 5. Dampen surface between coats.
- B. Final Coat Finish: Smooth.
- C. Curing: Moist-cure waterproofing for three days immediately after final coat has set, followed by air drying, unless otherwise recommended in writing by manufacturer.
- 3.4 FIELD QUALITY CONTROL
- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed application of waterproofing.
 - B. Prepare test and inspection reports.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board insulation.
2. Glass-fiber blanket insulation.
3. Mineral-wool board insulation.

B. Related Requirements:

1. Section 04 20 00 "Unit Masonry" for insulation installed in masonry cells.
2. Section 07 21 19 "Foamed-in-Place Insulation" for spray-applied polyurethane foam insulation.
3. Section 07 54 23 "Thermoplastic-Polyolefin (TPO) Roofing" for insulation specified as part of roofing construction.
4. Section 09 29 00 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Extruded polystyrene foam-plastic board insulation.
2. Glass-fiber blanket insulation.
3. Mineral-wool board insulation.

1.3 INFORMATIONAL SUBMITTALS

A. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.

1. For blown-in or sprayed fiberglass loose-fill insulation, indicate initial installed thickness, settled thickness, settled R-value, installed density, coverage area, and number of bags installed.
2. Sign, date, and post the certification in a conspicuous location on Project site.

B. Research Reports: For foam-plastic insulation, from ICC-ES.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with

manufacturer's written instructions for handling, storing, and protecting during installation.

- B. Protect foam-plastic board insulation as follows:
1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

- A. Extruded Polystyrene Board, Type IV Designation: ASTM C578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DiversiFoam Products; Certifoam 25 SL.
 - b. Dow Chemical Company (The); Cavitymate Tongue and Groove.
 - c. Owens Corning; Foamular 250 Tongue and Groove Edge.
 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Glass-Fiber Blanket Insulation, Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. CertainTeed Insulation.
 - c. Johns Manville; a Berkshire Hathaway company.
 - d. Knauf Insulation.
 - e. Owens Corning.
 2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
 4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.3 MINERAL-WOOL BOARD INSULATION

- A. Mineral-Wool Board Insulation, Type III, Unfaced: ASTM C612, Type III; passing ASTM E136 for combustion characteristics.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. Rockwool International.
 - c. Thermafiber, Inc.; an Owens Corning company.
 2. Nominal Density: 8 lb/cu. ft..
 3. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.
 4. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
 5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.4 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGM Industries, Inc.
 - b. Gemco.
 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inc in diameter; length to suit depth of insulation.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGM Industries, Inc.
 - b. Gemco.
- C. 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.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Gemco.
- D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGM Industries, Inc.
 - b. Gemco.

2.5 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.

2. Show width of cavity on Drawings.
 3. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
 4. 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.
 5. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.
- 3.4 INSTALLATION OF CAVITY-WALL INSULATION
- A. Mineral-Wool Board Insulation: Install insulation fasteners 4 inches from each corner of board insulation, at center of board, and as recommended by manufacturer.
1. Fit courses of insulation between masonry wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
 2. Press units firmly against inside substrates.
- 3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION
- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
- 3.6 PROTECTION
- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

- B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 07 21 19

FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Closed-cell spray polyurethane foam.
- B. Related Requirements:
 - 1. Section 07 21 00 "Thermal Insulation" for foam-plastic board insulation.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

- A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 1.5 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation.
 - b. BaySystems NorthAmerica, LLC.
 - c. Dow Chemical Company (The).
 - d. ERSystems, Inc.
 - e. Gaco Western Inc.
 - f. Henry Company.
 - g. Icynene Inc.
 - h. NCFI; Division of Barnhardt Mfg. Co.
 - i. SWD Urethane Company.
 - j. Volatile Free, Inc.

2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.
- B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Spray insulation to envelop entire area to be insulated and fill voids.
- C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.
- D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.
- E. Cavity Walls: Install into cavities to thickness indicated on Drawings.
- F. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.3 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION

SECTION 07 27 26

FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vapor-permeable, fluid-applied air barriers.

B. Related Requirements:

1. Section 06 16 00 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

1.2 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

- C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 - 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
 - 1. Protect substrates from environmental conditions that affect air-barrier performance.
 - 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.
- B. VOC Content: 100 g/L or less.
- C. Low-Emitting Materials: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

2.3 HIGH-BUILD AIR BARRIERS, VAPOR PERMEABLE

- A. High-Build, Vapor-Permeable Air Barrier: Modified bituminous or synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.
1. Modified Bituminous Type:
 - a. Henry Company; Air-Bloc 17 MR.
 - a. Hohmann & Barnard, Inc.; Tetroflash Liquid VP.
 - b. Meadows, W. R., Inc.; Air-Shield LMP.
 - c. Tremco Incorporated, an RPM company; ExoAir 220R.
 2. Synthetic Polymer Type:
 - a. Grace, W. R., & Co. - Conn.; Perm-A-Barrier VPL.
 - b. Henry Company; Air-Bloc 31 or Air-Bloc 33.
 - c. Tremco Incorporated, an RPM company; ExoAir 230.
 3. Physical and Performance Properties:
 - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
 - b. Vapor Permeance: Minimum 10 perms; ASTM E 96/E 96M, Desiccant Method, Procedure A.
 - c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.
 - d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D 4541.
 - e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 - f. UV Resistance: Can be exposed to sunlight for 30 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

- A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
 3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.
- H. Bridge isolation joints, expansion joints, and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

- A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
 3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.

4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
- B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
 1. Transition Strip: Roll firmly to enhance adhesion.
- F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- H. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, transition strip.
- I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

- A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
- B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.

1. Vapor-Permeable, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils, applied in one or more equal coats.
- C. Do not cover air barrier until it has been tested and inspected by testing agency.
- D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

- A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 2. Air-barrier dry film thickness.
 3. Continuous structural support of air-barrier system has been provided.
 4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 5. Site conditions for application temperature and dryness of substrates have been maintained.
 6. Maximum exposure time of materials to UV deterioration has not been exceeded.
 7. Surfaces have been primed, if applicable.
 8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
 9. Termination mastic has been applied on cut edges.
 10. Strips and transition strips have been firmly adhered to substrate.
 11. Compatible materials have been used.
 12. Transitions at changes in direction and structural support at gaps have been provided.
 13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 14. All penetrations have been sealed.
- D. Air barriers will be considered defective if they do not pass tests and inspections.
 1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.

2. Remove and replace deficient air-barrier components for retesting as specified above.
- E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
 1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.
- C. Remove masking materials after installation.

END OF SECTION

SECTION 07 42 13.23

METAL COMPOSITE MATERIAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes metal composite material wall panels and copings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Metal Composite Material Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal composite material panel accessories.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, tests performed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal composite material panels to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical metal composite material panel assembly as shown on Drawings, including corner, soffits, supports, attachments, and accessories.
 - 2. Water-Spray Test: Conduct water-spray test of mockup of metal composite material panel assembly, testing for water penetration according to AAMA 501.2.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal composite material panels, and other manufactured items so as not to be damaged or deformed. Package metal composite material panels for protection during transportation and handling.
- B. Unload, store, and erect metal composite material panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal composite material panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal composite material panels to ensure dryness, with positive slope for drainage of water. Do not store metal composite material panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal composite material panels during installation.

1.7 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal composite material panels to be performed according to manufacturers' written instructions and warranty requirements.

1.8 COORDINATION

- A. Coordinate metal composite material panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 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. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Wall panels and copings shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Structural Performance: Provide metal composite material panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:
 1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- C. Copings:
 1. FM Approvals' Listing: Manufacture and install copings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- E. Fire Propagation Characteristics: Metal composite material wall panel system passes NFPA 285 testing.

2.2 CWP, 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 assembly components, panel stiffeners, and accessories required for weathertight system.
 1. Basis-of-Design Product: 3A composites USA, Inc.; Rainscreen II or comparable product by one of the following:
 - a. Alcoa Inc.; Reynobond PE.
 - a. CENTRIA Architectural Systems; Formabond Wall System.
 - b. Citadel Architectural Products, Inc.; Envelope 2000 RS.
 - c. Protean Construction Products, Inc.; ACM 100.
- B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- thick, coil-coated aluminum sheet facings.

1. Panel Thickness: 0.157 inch.
2. Core: Fire retardant.
3. Exterior Finish: Anodized Aluminum.
 - a. Color: Match Architect's samples.
- C. Attachment Assembly Components: Formed from extruded aluminum.
- D. Attachment Assembly: Rainscreen principle system.

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 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal composite material 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 composite material panels unless otherwise indicated.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal composite material panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal composite material panels.
- D. 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.
- E. Panel Sealants: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal composite material panels and remain weathertight; and as recommended in writing by metal composite material panel manufacturer.

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. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Aluminum Panels and Accessories:
 1. Mica Fluoropolymer: AAMA 2605. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal composite material panel supports, and other conditions affecting performance of the Work.
 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal composite material wall panel manufacturer.
 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal composite material wall panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

- B. Examine roughing-in for components and assemblies penetrating metal composite material panels to verify actual locations of penetrations relative to seam locations of metal composite material panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal composite material panel manufacturer's written recommendations.

3.3 METAL COMPOSITE MATERIAL PANEL INSTALLATION

- A. General: Install metal composite material panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal composite material panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving metal composite material panels.
 - 2. Flash and seal metal composite material panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistant barriers and flashings that will be concealed by metal composite material panels are installed.
 - 3. Install screw fasteners in predrilled holes.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Install flashing and trim as metal composite material panel work proceeds.
 - 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 - 7. Align bottoms of metal composite material panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 - 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 - 1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal composite material panel manufacturer.
- D. 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.

- E. Installation: Attach metal composite material wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.
 - 1. Rainscreen Systems: Do not apply sealants to joints unless otherwise indicated.
- F. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-returned flanges of wall panels to panel clips with manufacturer's standard fasteners.
 - 1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Section 07 92 00 "Joint Sealants."
 - 2. Seal horizontal and vertical joints between adjacent metal composite material wall panels with manufacturer's standard gaskets.
- G. Track-Support Installation: Install support assembly at locations, spacings, and with fasteners recommended by manufacturer. Use manufacturer's standard horizontal tracks and vertical [tracks] [drain channels] that provide support and secondary drainage assembly, draining to the exterior at horizontal joints through drain tube. Attach metal composite material wall panels to tracks by interlocking panel edges with manufacturer's standard "T" clips.
 - 1. Attach flush wall panels to perimeter extrusions by engaging panel edges and by attaching with manufacturer's standard structural silicone adhesive.
 - 2. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
 - 3. Do not apply sealants to joints unless otherwise indicated.
- H. Rainscreen-Principle Installation: Install using manufacturer's standard assembly with vertical channel that provides support and secondary drainage assembly, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach metal composite material wall panels by inserting horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.
 - 1. Install wall panels to allow individual panels to be installed and removed without disturbing adjacent panels.
 - 2. Do not apply sealants to joints unless otherwise indicated.
- I. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal composite material panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal composite material panel manufacturer; or, if not indicated, provide types recommended in writing by metal composite material panel manufacturer.
- J. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide

concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 COPING INSTALLATION

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor copings to meet performance requirements.
 1. Interlock face leg drip edge into continuous cleat anchored to substrate at manufacturer's required spacing that meets performance requirements but, not less than 16-inch (400-mm) centers. Anchor back leg of coping with screw fasteners and elastomeric washers at manufacturer's required spacing that meets performance requirements but, not less than 16-inch (400-mm) centers.
 2. Provide return legs and wet seal all horizontal joints.
- C. Coping Joints locations:
 1. Align with fascia joints, control joints, window mullions and other building elements where indicated.
 2. Fabricate corners as one unit with joints a minimum of two-feet from corner in each direction. Use uniform 12 foot lengths, and cut filler length.

3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal composite material wall panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing agency to perform field tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal composite material wall panel installation, including accessories.
- C. Metal composite material wall panels will be considered defective if they do not pass test and inspections.
- D. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

- E. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal composite material panel installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.
- B. After metal composite material panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal composite material panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 54 23

THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered thermoplastic polyolefin (TPO) roofing system.
2. Substrate board.
3. Roof insulation.
4. Cover board.
5. Walkways.
6. Roof expansion joint assembly.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Carpentry" for wood nailers, curbs, and blocking.
2. Section 07 21 00 "Thermal Insulation" for insulation beneath the roof deck.
3. Section 07 42 13.23 "Metal Composite Material Wall Panels" for copings.
4. Section 07 62 00 "Sheet Metal Flashing and Trim" for field formed metal copings, roof flashings and counterflashings.
5. Section 07 72 00 "Roof Accessories."
6. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
7. Division 22 for roof drains.

1.2 DEFINITIONS

- ###### A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.3 PREINSTALLATION MEETINGS

- ###### A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.

1. Meet with Owner, Architect, Construction Manager, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
 1. Layout and thickness of insulation.
 2. Base flashings and membrane termination details.
 3. Flashing details at penetrations.
 4. Tapered insulation layout, thickness, and slopes.
 5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
 6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
 7. Tie-in with adjoining air barrier.
- C. Samples for Verification: For the following products:
 1. Roof membrane and flashings, of color required.
 2. Roof paver, full sized, in each color and texture required.
 3. Walkway pads or rolls, of color required.
- D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.

- B. Manufacturer Certificates:
 - 1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - a. Submit evidence of compliance with performance requirements.
 - 2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
 - C. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.
 - D. Evaluation Reports: For components of roofing system, from ICC-ES.
 - E. Field quality-control reports.
 - F. Sample Warranties: For manufacturer's special warranties.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For roofing system to include in maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.
 - B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
 - B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
 - C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
 - D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, substrate board, roof pavers, and other components of roofing system.
 - 2. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
 - 1. Warranty Period: Two years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
 - 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
 - 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.
 - 1. Fire/Windstorm Classification: Class 1A-120
 - 2. Hail-Resistance Rating: FM Global Property Loss Prevention Data Sheet 1-34 SH.

- D. Solar Reflectance Index (SRI): Three-year-aged SRI not less than 64 or initial SRI not less than 82 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
- E. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- F. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

- A. TPO Sheet: ASTM D6878/D6878M, internally fabric- or scrim-reinforced, fabric-backed TPO sheet.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle SynTec Incorporated.
 - b. Firestone Building Products.
 - c. GAF.
 - d. GenFlex Roofing Systems.
 - e. Versico Roofing Systems.
 - 2. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.
 - 3. Thickness: 60 mils, nominal.
 - 4. Exposed Face Color: Gray.

2.3 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 - 1. Adhesives and sealants shall comply with the following limits for VOC content:
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.
 - d. Fiberglass Adhesives: 80 g/L.
 - e. Contact Adhesives: 80 g/L.
 - f. PVC Welding Compounds: 510 g/L.
 - g. Other Adhesives: 250 g/L.
 - h. Single-Ply Roof Membrane Sealants: 450 g/L.
 - i. Nonmembrane Roof Sealants: 300 g/L.
 - j. Sealant Primers for Nonporous Substrates: 250 g/L.
 - k. Sealant Primers for Porous Substrates: 775 g/L.
 - 2. Adhesives and sealants shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.

- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- D. Roof Vents: As recommended by roof membrane manufacturer.
 - 1. Size: Not less than 4-inch diameter.
- E. Bonding Adhesive: Manufacturer's standard, water based.
- F. Slip Sheet: Manufacturer's standard, of thickness required for application.
- G. Vented Base Sheet: ASTM D4897/D4897M, Type II; nonperforated, asphalt-impregnated fiberglass reinforced, with mineral granular patterned surfacing on bottom surface.
- H. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- I. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
- J. 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.

2.4 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M, fiber-reinforced gypsum board.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Georgia-Pacific Gypsum LLC.
 - c. National Gypsum Company.
 - d. USG Corporation.
 - 2. Thickness: Type X, 5/8 inch thick.
 - 3. Surface Finish: Factory primed.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.5 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by TPO roof membrane manufacturer.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Atlas EPS; a Division of Atlas Roofing Corporation.
 - b. Atlas Roofing Corporation.
 - c. Carlisle SynTec Incorporated.
 - d. Dyplast Products.

- e. Firestone Building Products.
 - f. Flex Membrane International Corp.
 - g. GAF.
 - h. Hunter Panels.
 - i. Insulfoam; Carlisle Construction Materials Company.
 - j. Johns Manville; a Berkshire Hathaway company.
 - k. Rmax, Inc.
2. Compressive Strength: 20 psi.
 3. Size: 48 by 48 inches.
 4. Thickness:
 - a. As required for a R-20 roof assembly.
- C. Tapered Insulation: Provide factory-tapered insulation boards.
1. Material: Match roof insulation.
 2. Minimum Thickness: 1/4 inch.
 3. Slope:
 - a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
 - b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.6 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
1. Full-spread, spray-applied, low-rise, two-component urethane adhesive.
 2. Adhesives and sealants shall comply with the following limits for VOC content:
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.
 - d. Fiberglass Adhesives: 80 g/L.
 - e. Contact Adhesives: 80 g/L.
 - f. PVC Welding Compounds: 510 g/L.
 - g. Other Adhesives: 250 g/L.
 - h. Single-Ply Roof Membrane Sealants: 450 g/L.
 - i. Nonmembrane Roof Sealants: 300 g/L.
 - j. Sealant Primers for Nonporous Substrates: 250 g/L.
 - k. Sealant Primers for Porous Substrates: 775 g/L.
 3. Adhesives and sealants shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- D. Cover Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M fiber-reinforced gypsum board.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Georgia-Pacific Gypsum LLC.
 - b. National Gypsum Company.
 - c. USG Corporation.
 - 2. Thickness: 1/2 inch.
 - 3. Surface Finish: Factory primed.

2.7 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.
 - 1. Size: Approximately 36 by 60 inches.

2.8 EXPANSION JOINT, ROOF TO WALL BELLOWS

- A. Flexible expansion joint membrane covers, provided by roof manufacturer fabricated from TPO membrane, nominally 0.060-inches thick, at roof to wall and roof to roof conditions, matching color to roofing assembly.
 - 1. Provide foam expansion tube to allow for movement of the joint.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00 "Steel Decking."
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Install sound-absorbing insulation strips according to acoustical roof deck manufacturer's written instructions.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.
- C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition.
- D. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under Section 07 27 26 "Fluid-Applied Membrane Air Barriers."

3.4 INSTALLATION OF SUBSTRATE BOARD

- A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.
 - 1. At steel roof decks, install substrate board at right angle to flutes of deck.
 - a. Locate end joints over crests of steel roof deck.
 - 2. Tightly butt substrate boards together.
 - 3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 4. Fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29.
 - 5. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.5 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.
- C. Installation Over Metal Decking:
 - 1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.

- a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - b. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - c. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - d. Fill gaps exceeding 1/4 inch with insulation.
 - e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
- a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
 - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - e. Fill gaps exceeding 1/4 inch with insulation.
 - f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - g. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
 - 1) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.6 INSTALLATION OF COVER BOARDS

- A. 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.
1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 2. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board so that water flow is unrestricted.
 3. Cut and fit cover board tight to projections, and penetrations.
 4. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
 - a. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.7 INSTALLATION OF ADHERED ROOF MEMBRANE

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow to relax before installing.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Owner's testing and inspection agency.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
- F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- G. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- H. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.8 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.9 EXPANSION JOINTS

- A. Install expansion joints in accordance with manufacturer's instructions.

- B. Fasten expansion joints to wood nailers, curbs or secured to walls with appropriate nails or manufacturer recommended fasteners.
- C. Mechanically attach roof membrane along the base of raised curb-expansion joints with screws and plates a minimum of 12" o.c.
 - 1. The expansion joint cover bellows shall be at least 2 times the expansion joint opening.
- D. Set metal nailing strip manufacturer's compatible sealant and secure with fasteners and neoprene washers fastened 6" o.c
- E. Expansion joints may be field fabricated.

3.10 INSTALLATION OF WALKWAYS

- A. Flexible Walkways:
 - 1. Install flexible walkways at the following locations:
 - a. Perimeter of each rooftop unit.
 - b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
 - c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
 - d. Top and bottom of each roof access ladder.
 - e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
 - f. Locations indicated on Drawings.
 - g. As required by roof membrane manufacturer's warranty requirements.
 - 2. Provide 6-inch clearance between adjoining pads.
 - 3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Owner will engage a qualified testing agency to perform the following tests:
 - 1. Low-Voltage Electrical Conductance Testing: Testing agency shall survey entire roof area and flashings to locate discontinuity in the roof membrane using an exposed metal electrical loop to create an electrical field tested with handheld probes.
 - a. Perform tests before overlying construction is placed.
 - b. After testing, repair areas of discontinuities, repeat tests, and make further repairs until roofing and flashing installations are contiguous.
 - 1) Cost of retesting is Contractor's responsibility.
 - c. Testing agency shall prepare survey report indicating locations of initial discontinuities, if any.

- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
- D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.12 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed wall sheet metal fabrications.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 07 72 00 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.2 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following

1. Underlayment materials.
2. Elastomeric sealant.
3. Butyl sealant.
4. Epoxy seam sealer.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.

5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 6. Include details of termination points and assemblies.
 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 8. Include details of roof-penetration flashing.
 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
 10. Include details of special conditions.
 11. Include details of connections to adjoining work.
- C. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For fabricator.
 - B. Sample Warranty: For special warranty.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.
 - B. Special warranty.
- 1.6 QUALITY ASSURANCE
- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
 1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.
 1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
 2. Protect stored sheet metal flashing and trim from contact with water.
 - B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.8 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:
 - 1. Design Pressure: As indicated on Drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with [smooth, flat surface].
 - 1. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in

both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.

2. Color: As selected by Architect from manufacturer's full range.
 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.
- C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed; with smooth, flat surface.
1. Finish: ASTM A480/A480M, No. 2B (bright, cold rolled).
 - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - b. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1) Run grain of directional finishes with long dimension of each piece.
 - 2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
- C. Solder:

1. For Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inchwide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C1311, 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 in accordance with ASTM D1187/D1187M.
- I. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
- J. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cheney Flashing Company.
 - b. Fry Reglet Corporation.
 - c. Heckmann Building Products, Inc.
 - d. Hickman Company, W. P.
 - e. Hohmann & Barnard, Inc.
 - f. Keystone Flashing Company, Inc.
 - g. National Sheet Metal Systems, Inc.
 2. Source Limitations: Obtain reglets from single source from single manufacturer.
 3. Material: Stainless steel, 0.0188 inch thick.
 4. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 5. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
 6. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
 7. Accessories:
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of

standard metal counterflashing or where Drawings show reglet without metal counterflashing.

- b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.

8. Finish: Mill.

2.5 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
 4. 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.
 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances:
 1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Seams:
 1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

- G. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters:

1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
2. Fabricate in minimum 96-inch-long sections.
3. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than twice the gutter thickness.
4. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
5. Gutter Profile: As indicated on Drawings.
6. Expansion Joints: Lap type.
7. Accessories: Wire-ball downspout strainer.
8. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
 - a. Aluminum: 0.032 inch thick.
9. Gutters with Girth 16 to 20 Inches: Fabricate from the following materials:
 - a. Aluminum: 0.040 inch thick.
10. Gutters with Girth 21 to 25 Inches: Fabricate from the following materials:
 - a. Aluminum: 0.050 inch thick.

B. Built-in Gutters:

1. Fabricate to cross section required, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required.
2. Fabricate in minimum 96-inch-long sections. Fabricate expansion joints and accessories from same metal as gutters unless otherwise indicated.
3. Fabricate gutters with built-in expansion joints and gutter-end expansion joints at walls.
4. Accessories: Wire-ball downspout strainer.
5. Fabricate from the following materials:
 - a. Stainless Steel: 0.0156 inch thick.

C. Downspouts: Fabricate downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.

1. Hanger Style: As indicated on Drawings.
2. Fabricate from the following materials:
 - a. Aluminum: 0.024 inch thick.

D. Downspout Nozzle: No-hub or PVC Slip-On, sized to match roof drain piping, provide length of nozzle to extend past face of façade brick by 2-inches.

1. Basis-of-Design: Zurn; Z199 Downspout Nozzle.
 - a. Finish: Plain Bronze body.
 - b. Stainless steel screen insert.
 - E. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch-wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from the following materials:
 1. Aluminum: 0.032 inch thick.
 - F. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:
 1. Aluminum: 0.032 inch thick.
- 2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS
- A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint cover plates. Shop fabricate interior and exterior corners.
 1. Joint Style: Overlapped, 4 inches wide.
 2. Fabricate with scuppers spaced apart as indicated on Drawings, to dimensions required with 4-inch-wide flanges and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
 3. Fabricate from the following materials:
 - a. Aluminum: 0.050 inch thick.
 - B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.
 1. Coping Profile: As indicated on Drawings.
 2. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.
 3. Fabricate from the following materials:
 - a. Aluminum: 0.050 inch thick.
 - C. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 1. Aluminum: 0.040 inch thick.
 - D. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 1. Aluminum: 0.032 inch thick.
 - E. Flashing Receivers: Fabricate from the following materials:
 1. Aluminum: 0.032 inch thick.
 - F. Roof-Penetration Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.0188 inch thick.

2.8 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch-high, end dams. Fabricate from the following materials:
 1. Stainless Steel: 0.0156 inch thick.
- B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:
 1. Aluminum: 0.032 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.
 1. Install in shingle fashion to shed water.
 2. Lap joints not less than 2 inches.
- B. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.
 1. Install in shingle fashion to shed water.
 2. Lapp joints not less than 4 inches.

3.3 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.
 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
 5. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
 7. Do not field cut sheet metal flashing and trim by torch.
 8. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of uncoated-aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
 2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 3. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
 - a. Embed hooked flanges of joint members not less than 1 inch into sealant.
 - b. Form joints to completely conceal sealant.
 - c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.

- d. Adjust setting proportionately for installation at higher ambient temperatures.
 - 1) Do not install sealant-type joints at temperatures below 40 deg F.
 2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
 2. Do not solder aluminum sheet.
 3. Do not use torches for soldering.
 4. Heat surfaces to receive solder, and flow solder into joint.
 - a. Fill joint completely.
 - b. Completely remove flux and spatter from exposed surfaces.
 5. Stainless Steel Soldering:
 - a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
 - b. Promptly remove acid-flux residue from metal after tinning and soldering.
 - c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- 3.4 INSTALLATION OF ROOF-DRAINAGE SYSTEM
- A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters:
1. Join sections with riveted and soldered joints or joints sealed with sealant.
 2. Provide for thermal expansion.
 3. Attach gutters at eave or fascia to firmly anchor them in position.
 4. Provide end closures and seal watertight with sealant.
 5. Slope to downspouts.
 6. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
- C. Built-in Gutters:
1. Join sections with riveted and soldered joints or joints sealed with sealant.
 2. Provide for thermal expansion.
 3. Slope to downspouts.
 4. Provide end closures and seal watertight with sealant.
 5. Install underlayment layer in built-in gutter trough and extend to drip edge at eaves and under underlayment on roof sheathing.
 - a. Lap sides minimum of 2 inches over underlying course.
 - b. Lap ends minimum of 4 inches.

- c. Stagger end laps between succeeding courses at least 72 inches.
 - d. Fasten with roofing nails.
 - e. Install slip sheet over underlayment.
 6. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 18 inches apart.
 - D. Downspouts:
 1. Join sections with 1-1/2-inch telescoping joints.
 2. Provide hangers with fasteners designed to hold downspouts securely to walls.
 3. Locate hangers at top and bottom and at approximately 60 inches o.c.
 4. Provide elbows at base of downspout to direct water away from building.
 5. Connect downspouts to underground drainage system.
 - E. Splash Pans:
 1. Install where downspouts discharge on low-slope roofs.
 2. Set in asphalt roofing cement or elastomeric sealant compatible with the substrate.
 - F. Parapet Scuppers:
 1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
 2. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.
 3. Loosely lock front edge of scupper with conductor head.
 4. Seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.
 - G. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch below scupper discharge.
 - H. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated on Drawings. Lap joints minimum of 4 inches in direction of water flow.
- 3.5 INSTALLATION OF ROOF FLASHINGS
- A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.
 1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
 2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
 - B. Roof Edge Flashing:
 1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.

2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. Copings:
1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
 2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.
 - a. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch centers.
 - b. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
 2. Extend counterflashing 4 inches over base flashing.
 3. Lap counterflashing joints minimum of 4 inches.
 4. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.
- 3.6 INSTALLATION OF WALL FLASHINGS
- A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
 - B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.
 - C. Reglets: Installation of reglets is specified in Section 03 30 00 "Cast-in-Place Concrete." Section 04 20 00 "Unit Masonry."
- 3.7 INSTALLATION OF MISCELLANEOUS FLASHING
- A. Equipment Support Flashing:
 1. Coordinate installation of equipment support flashing with installation of roofing and equipment.
 2. Weld or seal flashing with elastomeric sealant to equipment support member.
 - B. Overhead-Piping Safety Pans:

1. Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings.
2. Pipe and install drain line to plumbing waste or drainage system.

3.8 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.9 CLEANING

- 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.

3.10 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.
- C. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION

SECTION 07 72 00

ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof curbs.
2. Equipment supports.
3. Preformed flashing sleeves.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for metal vertical ladders, and stairs for access to roofs.
2. Section 05 52 13 "Pipe and Tube Railings" for safety railing systems attached to roof stairs.
3. Section 07 62 00 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.2 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - 1. Size and location of roof accessories specified in this Section.
 - 2. Method of attaching roof accessories to roof or building structure.
 - 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
 - 4. Required clearances.
- B. Sample Warranties: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.6 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Wind-Restraint Performance: As indicated on Drawings.

2.2 ROOF CURBS

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically

fastened and sealed corner joints, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adaptable Air Products.
 - b. AES Industries, Inc.
 - c. Air Balance; a division of MESTEK, Inc.
 - d. Conn-Fab Sales, Inc.
 - e. Curbs Plus, Inc.
 - f. Custom Solution Roof and Metal Products.
 - g. Greenheck Fan Corporation.
 - h. KCC International Inc.
 - i. Kingspan Light + Air, North America.
 - j. Lloyd Industries, Inc.
 - k. LMCurbs.
 - l. Louvers & Dampers, Inc.; a division of Mestek, Inc.
 - m. Metallic Products Corp.
 - n. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - o. Pate Company (The).
 - p. Plenums Incorporated.
 - q. Roof Curb Systems.
 - r. Roof Products and Systems (RPS); a division of Hart & Cooley, Inc.
 - s. Roof Products, Inc.
 - t. Sunoptics Skylights and Daylighting Systems; Acuity Brands International, Inc.
 - u. Thybar Corporation.
 - v. Vent Products Co., Inc.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.
- D. Material: Zinc-coated (galvanized) steel sheet, 0.052 inch thick.
 1. Finish: Baked enamel or powder coat.
 2. Color: As selected by Architect from manufacturer's full range.
- E. Construction:
 1. Curb Profile: Manufacturer's standard compatible with roofing system.
 2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
 3. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
 4. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange or by use of leveler frame.
 5. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.

6. Insulation: Factory insulated with 1-1/2-inch-thick glass-fiber board insulation.
7. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to meet wind uplift requirements.
8. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

2.3 EQUIPMENT SUPPORTS

- A. Equipment Supports: Internally reinforced perimeter metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded corner joints and integrally formed structure-mounting flange at bottom.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adaptable Air Products.
 - b. AES Industries, Inc.
 - c. Air Balance; a division of MESTEK, Inc.
 - d. Conn-Fab Sales, Inc.
 - e. Curbs Plus, Inc.
 - f. Custom Solution Roof and Metal Products.
 - g. Greenheck Fan Corporation.
 - h. KCC International Inc.
 - i. Lloyd Industries, Inc.
 - j. LMCurbs.
 - k. Louvers & Dampers, Inc.; a division of Mestek, Inc.
 - l. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - m. Pate Company (The).
 - n. Plenums Incorporated.
 - o. Roof Curb Systems.
 - p. Roof Products and Systems (RPS); a division of Hart & Cooley, Inc.
 - q. Roof Products, Inc.
 - r. Thybar Corporation.
 - s. Vent Products Co., Inc.
 - B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
 - C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.
 - D. Material: Zinc-coated (galvanized) steel sheet, 0.052 inch thick.
 1. Finish: Baked enamel or powder coat.
 2. Color: As selected by Architect from manufacturer's full range.
 - E. Construction:
 1. Curb Profile: Manufacturer's standard compatible with roofing system.

2. Insulation: Factory insulated with 1-1/2-inch-thick glass-fiber board insulation.
3. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb of size and spacing required to meet wind uplift requirements.
4. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
5. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
6. Fabricate equipment supports to minimum height of 12 inches above roofing surface unless otherwise indicated.
7. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.

2.4 PREFORMED FLASHING SLEEVES

- A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches high, with removable metal hood and slotted metal collar.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Solution Roof and Metal Products.
 - b. Menzies Metal Products.
 - c. Thaler Metal Industries Ltd.
 2. Metal: Aluminum sheet, 0.063 inch thick.
 3. Diameter: As required to fit penetrating pipes.
 4. Finish: Manufacturer's standard.
- B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Solution Roof and Metal Products.
 - b. Menzies Metal Products.
 - c. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - d. Thaler Metal Industries Ltd.
 2. Metal: Aluminum sheet, 0.063 inch thick.
 3. Height: 13 inches.
 4. Diameter: As indicated on Drawings.
 5. Finish: Manufacturer's standard.

2.5 METAL MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 coating designation.
 - 1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.
 - 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.
- B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, AZ50 coated.
 - 1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.
 - 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.
- C. Aluminum Sheet: ASTM B209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
 - 1. Exposed Coil-Coated Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.
- D. Aluminum Extrusions and Tubes: ASTM B221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.
- E. Stainless Steel Sheet and Shapes: ASTM A240/A240M or ASTM A666, Type 304.
- F. Steel Shapes: ASTM A36/A36M, hot-dip galvanized according to ASTM A123/A123M unless otherwise indicated.
- G. Steel Tube: ASTM A500/A500M, round tube.
- H. Galvanized-Steel Tube: ASTM A500/A500M, round tube, hot-dip galvanized according to ASTM A123/A123M.
- I. Steel Pipe: ASTM A53/A53M, galvanized.

2.6 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Cellulosic-Fiber Board Insulation: ASTM C208, Type II, Grade 1, thickness as indicated.
- C. Glass-Fiber Board Insulation: ASTM C726, nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F, thickness as indicated.
- D. Polyisocyanurate Board Insulation: ASTM C1289, thickness and thermal resistivity as indicated.
- E. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWWPA C2; not less than 1-1/2 inches thick.
- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- G. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 - 1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
- H. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- I. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- J. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
- K. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof Curb Installation: Install each roof curb so top surface is level.
- D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
- E. Preformed Flashing-Sleeve and Flashing Pipe Portal Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane according to roof membrane manufacturer's instructions.
 - 1. Install roof walkway support pads prior to placement of roof walkway support stands onto low-slope roofing.

- F. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A780/A780M.
- B. Clean exposed surfaces according to manufacturer's written instructions.
- C. Clean off excess sealants.
- D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 81 00
APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes sprayed fire-resistive materials.
- B. Related Requirements:
 - 1. Section 07 81 23 "Intumescent Fireproofing" for mastic and intumescent fire-resistive coatings.

1.2 DEFINITIONS

- A. SFRM: Sprayed fire-resistive materials.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Framing plans or schedules, or both, indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of fireproofing.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg For lower unless temporary protection and heat are provided

to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. VOC Content: For field applications, coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 50 g/L.
 - 3. Primers, Sealers, and Undercoaters: 100 g/L.
- E. Low-Emitting Materials: For field applications, coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

- A. SFRM, Sprayed Fire-Resistive Material: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carboline Company; RPM International; AD Southwest Fireproofing Type 5GP.
 - b. Grace Construction Products; W.R. Grace & Co. -- Conn; Grace Construction Products; Monokote MK-6 Series.
 - c. Isolatek International, Inc; Cafco 300.
 - d. Southwest Fireproofing Products Co; Type 5GP.

2. Application: Designated for exterior use by a qualified testing agency acceptable to authorities having jurisdiction.
3. Bond Strength: Minimum 200-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E 736.
4. Density: Not less than density specified in the approved fire-resistance design, according to ASTM E 605.
5. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch.
6. Combustion Characteristics: ASTM E 136.
7. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 10 or less.
 - b. Smoke-Developed Index: 10 or less.
8. Compressive Strength: Minimum 10 lbf/sq. in. according to ASTM E 761.
9. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
10. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
11. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
12. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours according to ASTM E 859.
13. Finish: Spray-textured finish.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:
 1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
 - 1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 - 2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Verify that concrete work on steel deck is complete before beginning fireproofing work.
- C. Verify that roof construction, installation of rooftop HVAC equipment, and other related work are complete before beginning fireproofing work.
- D. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.
- E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
 - C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
 - D. Metal Decks:
 - 1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, is completed.
 - 2. Do not apply fireproofing to underside of metal roof deck until roofing is completed; prohibit roof traffic during application and drying of fireproofing.
 - E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
 - F. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
 - G. Extend fireproofing in full thickness over entire area of each substrate to be protected.
 - H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
 - I. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
 - J. Cure fireproofing according to fireproofing manufacturer's written instructions.
 - K. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
 - L. Finishes: Where indicated, apply fireproofing to produce the following finishes:
 - 1. Spray-Textured Finish: Finish left as spray applied with no further treatment.
- 3.4 FIELD QUALITY CONTROL
- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by the IBC, Subsection 17 05 .13, "Sprayed Fire-Resistant Materials."
 - B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for

previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION

SECTION 07 81 23

INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mastic and intumescent fire-resistive coatings for steel substrates and wood substrates.

B. Related Requirements:

1. Section 07 81 00 "Applied Fireproofing" for sprayed fire-resistive materials (SFRM).

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Framing plans or schedules, or both, indicating the following:

1. Extent of fireproofing for each construction and fire-resistance rating.
2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
4. Treatment of fireproofing after application.

C. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions in size.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Product Certificates: For each type of fireproofing.

C. Evaluation Reports: For fireproofing, from ICC-ES.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup of as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 50 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing for each fire-resistance design from
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. VOC Content: For field applications, coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 50 g/L.
 3. Primers, Sealers, and Undercoaters: 100 g/L.
- E. Low-Emitting Materials: For field applications, coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Asbestos: Provide products containing no detectable asbestos.

2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

- A. IFRC-1, Mastic and Intumescent Fire-Resistive Coating: Manufacturer's standard, factory-mixed formulation or factory-mixed, multicomponent system consisting of

intumescent base coat and topcoat, and complying with indicated fire-resistance design.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Albi Manufacturing; a division of StanChem, Inc.; Albi Clad TF.
 - b. Carboline Company; a subsidiary of RPM International.; AD Firefilm III.
 - c. Isolatek International; Cafco SprayFilm-WB 5.
 2. Application: Designated for "interior general purpose" and "conditioned interior space purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.
 3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
 4. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 50 or less.
 5. Finish: Smooth without texture.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range.
- B. IFRC-2, Intumescent Fire-Resistive Coating: Heavy duty, water and resin based intumescent application on wood substrates.
1. Basis-of-Design Product: Universal Fire Shield Products; Fire-Kote 100 / FK-100.
 2. Application: Designated for "exterior and interior general purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.
 3. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 50 or less.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
 - 1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 - 2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
- E. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- F. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- H. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- I. Cure fireproofing according to fireproofing manufacturer's written instructions.
- J. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- K. Finishes: Where indicated, apply fireproofing to produce the following finishes:
 - 1. Smooth without texture.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by the IBC, Subsection 1705.15, "Mastic and intumescent fire-resistant coatings."
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

3.6 SUBSTRATE SCHEDULE

- A. Refer to drawings for specific locations requiring mastic and intumescent fireproofing applications.
- B. IFRC-1: Steel substrates.
- C. IFRC-2: Wood substrates.

END OF SECTION

SECTION 07 84 13

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

B. Related Requirements:

1. Section 07 84 43 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.2 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.
- C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. A/D Fire Protection Systems Inc.
 - 2. Grace Construction Products.
 - 3. Hilti, Inc.
 - 4. Johns Manville.
 - 5. Nelson Firestop Products.

6. NUCO Inc.
7. Passive Fire Protection Partners.
8. RectorSeal Corporation.
9. Specified Technologies Inc.
10. 3M Fire Protection Products.
11. Tremco, Inc.; Tremco Fire Protection Systems Group.
12. USG Corporation.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is 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. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. Horizontal assemblies include floors.
 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
 1. Sealant shall have a VOC content of 250 g/L or less.
 2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-wool-fiber or rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
- D. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- G. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support 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 firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Manufacturer's name.
 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of

Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
 - 1. Refer to Schedule on Drawing A61-93.

END OF SECTION

SECTION 07 84 43
JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints at exterior curtain-wall/floor intersections.
3. Joints in smoke barriers.

B. Related Requirements:

1. Section 07 84 13 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers and for wall identification.
2. Section 09 22 16 "Non-Structural Metal Framing" for firestop tracks for metal-framed partition heads.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."

2.2 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.

- b. A/D Fire Protection Systems Inc.
 - c. ClarkDietrich.
 - d. Hilti, Inc.
 - e. Nelson Firestop; a brand of Emerson Industrial Automation.
 - f. NUCO Inc.
 - g. Passive Fire Protection Partners.
 - h. RectorSeal.
 - i. Rockwool International.
 - j. Specified Technologies, Inc.
 - k. Thermafiber, Inc.; an Owens Corning company.
 - l. Tremco, Inc.
 - m. Willseal LLC.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E2307.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. ClarkDietrich.
 - c. Hilti, Inc.
 - d. Johns Manville; a Berkshire Hathaway company.
 - e. Nelson Firestop; a brand of Emerson Industrial Automation.
 - f. NUCO Inc.
 - g. RectorSeal.
 - h. Rockwool International.
 - i. Specified Technologies, Inc.
 - j. Thermafiber, Inc.; an Owens Corning company.
 - k. Tremco, Inc.
 - 2. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
- D. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. A/D Fire Protection Systems Inc.
 - c. Hilti, Inc.
 - d. Nelson Firestop; a brand of Emerson Industrial Automation.
 - e. NUCO Inc.
 - f. Passive Fire Protection Partners.
 - g. RectorSeal.
 - h. Rockwool International.
 - i. Specified Technologies, Inc.
 - j. Thermafiber, Inc.; an Owens Corning company.
 - k. Tremco, Inc.
 - l. Willseal LLC.

2. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.
- E. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.
1. Sealant shall have a VOC content of 250 g/L or less.
 2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Accessories: Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing joint firestopping systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install joint firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

- B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:
 - 1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
 - 3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated joint firestopping systems immediately and install new materials to produce joint firestopping systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN.
- B. Floor-to-Floor, Fire-Resistive Joint Systems:
 - 1. UL-Classified Systems: FF-S- 0000-0999.
 - 2. Assembly Rating: As indicated.
 - 3. Nominal Joint Width: As indicated.
 - 4. Movement Capabilities: Class I - 12-1/2 percent compression or extension.
- C. Wall-to-Wall, Fire-Resistive Joint Systems:
 - 1. UL-Classified Systems: WW-S-0000-0999.
 - 2. Assembly Rating: As indicated.
 - 3. Nominal Joint Width: As indicated.
 - 4. Movement Capabilities: Class I - 12-1/2 percent compression or extension.
- D. Floor-to-Wall, Fire-Resistive Joint Systems:
 - 1. UL-Classified Systems: FW-S-0000-0999.
 - 2. Assembly Rating: As indicated.
 - 3. Nominal Joint Width: As indicated.
 - 4. Movement Capabilities: Class I - 12-1/2 percent compression or extension.
- E. Head-of-Wall, Fire-Resistive Joint Systems:
 - 1. UL-Classified Systems: HW-S-0000-0999.
 - 2. Assembly Rating: As indicated.
 - 3. Nominal Joint Width: As indicated.
 - 4. Movement Capabilities: Class I - 12-1/2 percent compression or extension.
- F. Bottom-of-Wall, Fire-Resistive Joint Systems:
 - 1. UL-Classified Systems: BW-S-0000-0999.
 - 2. Assembly Rating: As indicated.

3. Nominal Joint Width: As indicated.
 4. Movement Capabilities: Class I - 12-1/2 percent compression or extension.
- G. Wall-to-Wall, Fire-Resistive Joint Systems Intended for Use as Corner Guards:
1. UL-Classified Systems: CG-S-0000-0999.
 2. Assembly Rating: As indicated.
 3. Nominal Joint Width: As indicated.
 4. Movement Capabilities: Class I - 12-1/2 percent compression or extension.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Nonstaining silicone joint sealants.
 - 2. Urethane joint sealants.
 - 3. Mildew-resistant joint sealants.
 - 4. Butyl joint sealants.
 - 5. Latex joint sealants.

1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.
- E. Sample Warranties: For special warranties.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.4 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.5 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content: Sealants and sealant primers shall comply with the following:
 1. Architectural sealants shall have a VOC content of 250 g/L or less.
 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
 3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
- B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dowsil; 795.
 - b. GE Construction Sealants; SilPruf NB.
 - c. Pecora Corporation; 864NST.
 - d. Tremco Incorporated; Spectrem 3.
- C. Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Dowsil; 790.

2.3 URETHANE JOINT SEALANTS

- A. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 50, Uses T and NT.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. LymTal International, Inc.; Iso-Flex 888QC.

2.4 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dowsil; 786-M White.
 - b. GE Construction Sealants; SCS1700 Sanitary.
 - c. Soudal USA; RTV GP.
 - d. Tremco Incorporated; Tremsil 200.

2.5 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
 - 1. Products: Subject to compliance with requirements, provide one of the following:

- a. Bostik, Inc.; Chem-Calk 300.
- b. Pecora Corporation; BC-158.

2.6 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals, LLC, Building Systems; Sonolac.
 - b. Pecora Corporation; AC-20.
 - c. Sherwin-Williams Company (The); 850A.
 - d. Tremco Incorporated; Tremflex 834.

2.7 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Construction Chemicals, LLC, Building Systems.
 - b. Construction Foam Products, a division of Nomaco, Inc.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and

repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS-1.
 - 1. Joint Locations:
 - a. Joints between concrete paving and building components.
 - b. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Urethane, M, P, 50, T, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces JS-2.
 - 1. Joint Locations:
 - a. Joints between horizontal metal panels.
 - b. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement JS-3.
 - 1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Acrylic latex.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS-4.
 - 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Concealed mastics JS-5.
 - 1. Joint Locations:
 - a. Aluminum thresholds.

- b. Sill plates.
 - c. Other joints as indicated on Drawings.
2. Joint Sealant: Butyl-rubber based.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION

SECTION 07 92 19

ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical joint sealants.

B. Related Requirements:

1. Section 07 92 00 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for non-acoustical applications.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Acoustical joint sealants.

B. Samples for Verification: For each type and color of acoustical joint sealant required.

1. Size: 1/2-inch-wide sealant joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Acoustical Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports:

1. Product Test Reports: For each type of acoustical joint sealant, for tests performed by qualified testing agency or manufacturer and witnessed by a qualified testing agency.

B. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

1.5 WARRANTY

- A. Installer's Special Warranty: Installer agrees to repair or replace acoustical 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. Manufacturer's Special Warranty: Manufacturer agrees to furnish acoustical joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACOUSTICAL JOINT SEALANTS

- A. Acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies in accordance with ASTM E90.
 - 1. Verify sealant has a VOC content of 250 g/L or less.
- B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C834.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
 - b. Grabber Construction Products; Acoustical Sealant GSC.
 - c. Hilti Incorporated; CP 506 Smoke and Acoustic Sealant.
 - d. Pecora Corporation; AC-20 FTR.
 - e. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - f. Tremco; Acoustical Sealant.
 - 2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

2.2 MISCELLANEOUS MATERIALS

- A. Primer (if required by manufacturer): Material recommended by acoustical joint-sealant manufacturer where required for adhesion of sealant to joint substrates.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C919, ASTM C1193, and manufacturer's written instructions for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.
- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs,

cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 07 95 00
EXPANSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior expansion control systems.
2. Exterior wall expansion control systems.

B. Related Requirements:

1. Section 07 54 23 "TPO Roofing" for roof membrane manufacturer's expansion control.
2. Section 07 84 43 "Joint Firestopping" for liquid-applied joint sealants in fire-resistive building joints.
3. Section 07 92 00 "Joint Sealants" for applied joint sealants and for elastomeric sealants without metal frames.
4. Section 09 66 23 "Resinous Matrix Terrazzo Flooring" to match to adjacent floor finish selection.

1.2 ACTION SUBMITTALS

- A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, blockout requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- B. Samples for Verification: For interior expansion control system, provide full width by 6 inches long in size. Provide additional revised samples, as requested by Architect, to achieve match with terrazzo flooring if initial sample submittal is not aesthetically satisfactory.
- C. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
1. Manufacturer and model number for each expansion control system.
 2. Expansion control system location cross-referenced to Drawings.
 3. Nominal joint width.
 4. Movement capability.
 5. Classification as thermal or seismic.
 6. Materials, colors, and finishes.
 7. Product options.

8. Fire-resistance ratings.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
 1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
 2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.
- B. Coordination: Coordinate installation of exterior wall expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.
- B. Seismic Performance: Expansion control systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified."
 2. Component Importance Factor is 1.0.

2.3 MANUFACTURERS

- A. Basis-of-Design Products: The design for each architectural joint system specified in Part 2 "Architectural Joint System" Article below is based on the products named. Subject to compliance with requirements, provide either the named products or comparable products by one of the other manufacturers listed.
 1. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.

2. Balco, Inc.
3. Construction Specialties, Inc.
4. InPro Corporation (IPC).
5. MM Systems Corporation.
6. Nystrom, Inc.
7. Watson Bowman Acme Corp.

- B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

2.4 MATERIALS

- A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.
1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Elastomeric Seals: ASTM E 1783; preformed elastomeric membranes or extrusions to be installed in metal frames.
- C. Compression Seals: ASTM E 1612; preformed elastomeric extrusions having an internal baffle system and designed to function under compression.
- D. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.
- E. Elastomeric Concrete: Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.
- F. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required fire-resistance rating.
- G. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- H. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.5 ARCHITECTURAL JOINT SYSTEMS

- A. General: Provide joint systems of design, basic profile, materials, and operation indicated. Provide units with the capability to accommodate joint widths indicated and variations in adjacent surfaces. Refer to Schedule at end of Section.
1. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline mitered corners where joint changes directions or abuts other materials.
 2. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.

3. Frames for Strip Seals: Designed with semiclosed cavity that provides a mechanical lock for seals of type indicated.
4. Public Arena Seals: Non-slip seals designed for installation on treads and risers and to lie flat with adjacent surfaces, and complying with ADA guidelines for public areas.

2.6 INTERIOR ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Two-coat, shop-applied, baked-on 70% fluoropolymer coating system based on Kynar 500 or Hylar 5000 resin (polyvinylidene fluoride, PVDF), formulated by a licensed manufacturer and applied by manufacturer's approved applicator, to meet AAMA 605.2-90.
- C. Coating system shall provide minimum 1.2 mil dry film thickness consisting of 0.2 to 0.4 mil primer and minimum 1.0 mil color coat, baked on at 450 degrees F. metal temperature.
- D. Color: Custom color to match adjacent terrazzo flooring.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion control system manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion control systems.
- C. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary to secure joint systems to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.
 - 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 - 2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper expansion control system installation and performance.
 - 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
 - 4. Repair or grout blockout as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
 - 5. Install frames in continuous contact with adjacent surfaces.
 - a. Shimming is not permitted.
 - 6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
- C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
 - 1. Provide in continuous lengths for straight sections.
 - 2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
 - 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer to both frame interfaces before installing compression seals.
- E. Foam Seals: Install with adhesive recommended by manufacturer.
- F. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.
- G. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion control system materials and associated work so complete assemblies comply with assembly performance requirements.
 - 1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

3.5 JOINT SCHEDULE

- A. Basis of Design Products, unless otherwise indicated:
 - 1. MM Systems.
- B. Provide fire rated devices where required or indicated to maintain fire rating of assembly through which device is penetrating.
- C. Interior Expansion Control Systems.
 - 1. Floor-to-Floor Expansion Joint Covers:
 - a. FSNE 300 12H, 2-Hour rated, 4-inch expansion joint.
- D. Exterior Expansion Control Systems. Include manufactured standard vapor barrier with all systems.
 - 1. Preformed Wall-Corner Expansion Joint:
 - a. EMSEAL; Colorseal.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.

B. Related Requirements:

1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.

7. Details of anchorages, joints, field splices, and connections.
 8. Details of accessories.
 9. Details of moldings, removable stops, and glazing.
- C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For door inspector.
1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
 2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
 3. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
- 1.6 CLOSEOUT SUBMITTALS
- A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.
- 1.7 QUALITY ASSURANCE
- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.
- B. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies shall meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
 - 2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
- B. Fire-Rated, Borrowed-Lite Assemblies: Assemblies complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.
- C. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.38 deg Btu/F x h x sq. ft. when tested according to ASTM C518.

2.2 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A. At locations indicated in the Door and Frame Schedule.
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated steel sheet, minimum thickness of 0.053 inch.
 - d. Edge Construction: Model 2, Seamless.
 - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
 - f. Core: Manufacturer's standard.
 - g. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated and temperature-rise-rated doors.
 - 2. Frames:
 - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
 - b. Construction: Full profile welded.
 - 3. Exposed Finish: Prime.

2.3 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

- B. Maximum-Duty Doors and Frames: ANSI/SDI A250.8, Level 4; ANSI/SDI A250.4, Level A. At locations indicated in the Door and Frame Schedule.
1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A60 coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
 - f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
 - g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
 - h. Core: Manufacturer's standard.
 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A60 coating.
 - b. Construction: Full profile welded.
 3. Exposed Finish: Prime for field applied high-performance coating.

2.4 BORROWED LITES

- A. Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch.
- B. Construction: Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
 3. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.6 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
- G. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.7 FABRICATION

- A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 2. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
4. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply primer.
- B. Primer: Comply with the following:
 1. Interior Doors and Frames: Section 09 91 23 "Interior Painting.
 2. Exterior Doors and Frames: Section 09 96 00 "High-Performance Coatings."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with 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 without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 2. Fire-Rated Openings: Install frames according to NFPA 80.
 3. Floor Anchors: Secure with postinstalled expansion anchors.

- a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
4. Solidly pack mineral-fiber insulation inside frames.
5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
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. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, Section 5.2.
 2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements according to NFPA 101, Section 7.2.1.15.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 REPAIR

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 12 19

INTERIOR ALUMINUM DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior aluminum frames for doors installed in gypsum board partitions.
2. Interior aluminum frames for glazing installed in gypsum board partitions.
3. Interior aluminum doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum frames:

1. Include elevations, sections, and installation details for each wall-opening condition.
2. Include details for each frame type, including dimensioned profiles and metal thicknesses.
3. Include locations of reinforcements and preparations for hardware.
4. Include details of anchorages, joints, field splices, connections, and accessories.
5. Include details of moldings, removable stops, and glazing.

C. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard sizes.

D. Product Schedule: For aluminum frames. Use same designations indicated on Drawings. Coordinate with door hardware schedule and glazing.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum frames to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Build mockup of each type of aluminum frame and door in typical wall area as shown on Drawings.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Frame Products: "FlushGlaze" Interior System as manufactured by RACO.
- B. Basis of Design Door Products:
 1. Swinging Aluminum and Glass Doors: RACO Series 250 narrow stile, having square glazing stops, and black EPDM glazing gaskets.
- C. Source Limitations: Obtain aluminum frames and frame-manufacturer's doors from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Framing members for each individual pane of glass shall be designed so the deflection of the edge of the glass perpendicular to the glass pane shall not exceed 1/175 of the glass edge length or 3/4 inch, whichever is less (IBC 2403.3)
- B. Where interior glazing is installed adjacent to a walking surface, the differential deflection of two adjacent unsupported edges shall be not greater than the thickness of the panels when a force of 50 pounds per linear foot (plf) is applied horizontally to one panel at any point up to 42 inches above the walking surface (IBC 2403.4)

2.3 COMPONENTS

- A. Aluminum Framing: ASTM B 221, with alloy and temper required to suit structural and finish requirements, and not less than 0.062 inch thick.
- B. Door Frames: Extruded aluminum, reinforced for hinges, strikes, and closers.
- C. Glazing Frames: Extruded aluminum, for indicated glass thickness.
- D. Doors: Manufacturer's standard, factory-assembled, 1-3/4-inch-thick, aluminum-framed door construction.
 1. Door Operation: Swinging.
 - a. Stiles: Narrow.
 - b. Rails: 3-3/4-inch top rail and 6-inch bottom rail.
- E. Door Finish: Match frame and trim finish.
- F. Frame and Trim Finish: Color-anodized aluminum.
 1. Color: Black.

2.4 GLAZING

- A. Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), tested for surface and edge compression per ASTM C1048 and for impact strength per 16 CFR 1201 for Category II materials.
 - 1. Class 1: Clear monolithic.
 - a. 1/2 inch up to 8-feet tall.
 - b. Locations: As indicated.
 - 2. Exposed Edges: Machine ground and flat polished.
 - 3. Butt Edges: Flat ground.
 - 4. Corner Edges: Lap-joint corners with exposed edges polished.
- B. Butt Joint Clear Copolymer Strips:
 - 1. Basis of Design Product: EZCC12 co-polyester glass partition joints as manufactured by C.R. Laurence Co., Inc.

2.5 ACCESSORIES

- A. Fasteners: Aluminum, nonmagnetic, stainless-steel or other noncorrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.
- B. Door Silencers: Manufacturer's standard continuous mohair, wool pile, or vinyl seals in black color.
- C. Glazing Gaskets: Manufacturer's standard extruded or molded rubber or plastic, to accommodate glazing thickness indicated; in black.
- D. Door Hardware: As specified in Section 08 71 00 "Door Hardware," unless noted otherwise.

2.6 FABRICATION

- A. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted and mitered connections.
- B. Factory prepare aluminum frames to receive templated mortised hardware; include cutouts, reinforcements, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 08 71 00 "Door Hardware."
- C. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.
 - 1. Locate removable stops on the inside of spaces accessed by keyed doors.
- D. Fabricate components to allow secure installation without exposed fasteners.

2.7 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.

2.8 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install aluminum frames plumb, rigid, properly aligned, and securely fastened in place; according to manufacturer's written instructions.
- B. Install frame components in the longest possible lengths with no piece less than 48 inches; components 96 inches or shorter shall be one piece.
 - 1. Fasten to suspended ceiling grid on maximum 48-inch centers, using sheet metal screws or other fasteners approved by frame manufacturer.
 - 2. Use concealed installation clips to produce tightly fitted and aligned splices and connections.
 - 3. Secure clips to extruded main-frame components and not to snap-in or trim members.
 - 4. Do not leave screws or other fasteners exposed to view when installation is complete.
- C. Glass: Install glass according to Section 08 80 00 "Glazing" and aluminum-frame manufacturer's written instructions.
- D. Install butt-joint strips according to manufacturer's instructions.
- E. Doors: Install doors aligned with frames and fitted with required hardware.
- F. Door Hardware: Install according to Section 08 71 00 "Door Hardware" and aluminum-frame manufacturer's written instructions.

3.3 ADJUSTING

- A. Inspect installation, correct misalignments, and tighten loose connections.
- B. Doors: Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly, and lubricate as recommended by manufacturer.
- C. Clean exposed frame surfaces promptly after installation, using cleaning methods recommended in writing by frame manufacturer and according to AAMA 609 & 610.

- D. Touch Up: Repair marred frame surfaces to blend inconspicuously with adjacent unrepaired surface so touchup is not visible from a distance of 48 inches as viewed by Architect. Remove and replace frames with damaged finish that cannot be satisfactorily repaired.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Five-ply flush wood doors for opaque finish.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 08 80 00 "Glazing" for glass view panels in flush wood doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Door louvers.
5. Door trim for openings.
6. Factory-machining criteria.
7. Factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
4. Dimensions and locations of blocking for hardware attachment.
5. Dimensions and locations of mortises and holes for hardware.
6. Clearances and undercuts.
7. Requirements for veneer matching.
8. Doors to be factory finished and application requirements.

C. Samples for Initial Selection: For factory-finished doors.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For door inspector.
 - 1. Smoke- and Draft-Control Assembly Door Inspector: Submit documentation of compliance with NFPA 105, Section 5.
 - 2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
 - 3. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Special warranties.
- B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- C. Smoke- and Draft-Control Assembly Inspector Qualifications: Inspector for field quality-control inspections of Smoke- and Draft-Control door assemblies shall comply with qualifications set forth in NFPA 105, Section 5 and the following:
 - 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.
- D. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 - 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons or cardboard cartons, and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed and weathertight, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Delamination of veneer.
 - b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.3 FLUSH WOOD DOORS, GENERAL

- A. Certified Wood: Wood doors shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001 and FSC STD-40-004.
- B. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

2.4 SOLID-CORE FIVE-PLY FLUSH WOOD DOORS FOR OPAQUE FINISH

- A. Interior Solid-Core Doors:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eggers Industries.
 - b. Lambton Doors.
 - c. Oshkosh Door Company.

- d. VT Industries Inc.
- 2. Architectural Woodwork Standards Grade: Premium.
- 3. Faces: Hardboard or MDF.
 - a. Hardboard Faces: ANSI A135.4, Class 1 (tempered) or Class 2 (standard).
 - b. MDF Faces: ANSI A208.2, Grade 150 or Grade 160.
- 4. Exposed Vertical and Top Edges: Any closed-grain hardwood.
- 5. Core for Non-Fire-Rated Doors:
 - a. ANSI A208.1, Grade LD-1 particleboard.
 - 1) Blocking: Provide wood blocking in particleboard-core doors as follows:
 - a) 5-inch top-rail blocking, in doors indicated to have closers.
 - b) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
 - c) 5-inch midrail blocking, in doors indicated to have exit devices.
 - b. Glued wood stave.
- 6. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.5 LIGHT FRAMES AND LOUVERS

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
 - 1. Wood Species: Any closed-grain hardwood.
 - 2. Profile: Flush rectangular beads.
- B. Metal Louvers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Activar Construction Products Group, Inc.
 - b. Allegion PLC.
 - c. Anemostat Products; a Mestek Company.
 - d. ASSA ABLOY
 - e. L & L Louvers, Inc.
 - f. LL Building Products, Inc.
 - g. McGill Architectural Products.
 - 2. Blade Type: Vision-proof, inverted Y.
 - 3. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, factory primed for paint finish.

2.6 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated.
 - 1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 2. Comply with NFPA 80 requirements for fire-rated doors.

- B. Factory machine doors for hardware that is not surface applied.
 - 1. Locate hardware to comply with DHI-WDHS-3.
 - 2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
 - 3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
 - 4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
- C. Openings: Factory cut and trim openings through doors.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Sections 08 80 00 "Glazing."
 - 3. Louvers: Factory install louvers in prepared openings.

2.7 FACTORY FINISHING

- A. Comply with referenced quality standard for factory finishing.
 - 1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 2. Finish faces, all four edges, edges of cutouts, and mortises.
 - 3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Opaque Finish:
 - 1. Architectural Woodwork Standards Grade: Premium.
 - 2. Finish: Architectural Woodwork Standards System-9, UV Curable, Acrylated Epoxy, Polyester, or Urethane.
 - 3. Color: As selected by Architect from manufacturer's full range.
 - 4. Sheen: Semigloss.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 08 71 00 "Door Hardware."
- B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 - 1. Install smoke- and draft-control doors in accordance with NFPA 105.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 - 1. Smoke- and Draft-Control Door Assembly Inspections: Inspect each smoke- and draft-control door assembly in accordance with NFPA 105, Section 5.2.
 - 2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each Smoke- and Draft-Control door assembly indicating compliance with each item listed in NFPA 105 and NFPA 101.

3.4 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details material descriptions, dimensions of individual components and profiles, and finishes.
- B. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

1.3 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Exposed Flanges:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acudor Products, Inc.
 - b. Babcock-Davis.
 - c. Cendrex Inc.
 - d. Elmdor/Stoneman Manufacturing Company; a division of Acorn Engineering Company.
 - e. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - f. Karp Associates, Inc.
 - g. Lane-Aire Manufacturing Corp.
 - h. Larsens Manufacturing Company.
 - i. Maxam Metal Products Limited.
 - j. Metropolitan Door Industries Corp.
 - k. MIFAB, Inc.
 - l. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - m. Nystrom, Inc.
 - n. Williams Bros. Corporation of America (The).

2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
3. Locations: Wall and ceiling.
4. Color: to match adjacent substrate surface.
5. Door Size: As indicated.
6. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage, factory primed.
7. Frame Material: Same material, thickness, and finish as door.
8. Latch and Lock:
 - a. Cam latch, screwdriver operated where indicated.
 - b. Prepared for mortise cylinder where indicated.

2.2 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- D. Frame Anchors: Same material as door face.
- E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
- D. Latch and Lock Hardware:
 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 2. Keys: Furnish two keys per lock and key all locks alike.
 3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 08 71 00 "Door Hardware."

2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior storefront framing.
 - 2. Interior manual-swing entrance doors and door-frame units.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, full-size details, and attachments to other work.
- C. Samples: For each exposed finish required.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing

those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, 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 structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Arcadia, Inc.
 2. Arch Aluminum & Glass Co., Inc.
 3. CMI Architectural.
 4. Commercial Architectural Products, Inc.
 5. EFCO Corporation.
 6. Kawneer North America.
 7. Leed Himmel Industries, Inc.
 8. Oldcastle BuildingEnvelope.
 9. Pittco Architectural Metals, Inc.
 10. TRACO.
 11. Tubelite.
 12. United States Aluminum.
 13. YKK AP America Inc.

2.3 ALUMINUM FRAMING

- A. Interior Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 1. Construction: Nonthermal.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Center.
 4. Finish: High-performance organic finish.
 5. Fabrication Method: Field-fabricated stick system.

- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Materials:
 - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.

2.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 - 1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - 2. Door Design: Narrow stile; 2-1/8-inch nominal width.
 - 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

2.5 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. Sealant shall have a VOC content of 250 g/L or less.

2.6 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. 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 isolation of glazing from framing members.
 - 4. Accommodations for mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

- C. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- D. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
 - 1. Color: Black.

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. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Set continuous sill members and flashing in full sealant bed as specified in Section 07 92 00 "Joint Sealants" to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install glazing as specified in Section 08 80 00 "Glazing."

END OF SECTION

SECTION 08 44 13

GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glazed aluminum curtain wall systems.
 - a. Two-sided, structural-sealant-glazed.
 - b. Mullion Cap Extension.

B. Related Requirements:

1. Section 07 84 43 "Joint Firestopping" perimeter fire-containment systems (safing insulation) field installed with glazed aluminum curtain walls.
2. Section 07 92 00 "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain walls and for sealants to the extent not specified in this Section.
3. Section 08 80 00 "Glazing" for curtain wall glazing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each type of vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Delegated-Design Submittal: For glazed aluminum curtain walls, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include calculations and requirements for achieving high-spans as shown on the drawings. Show additional steel reinforcement required on design submittals.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Installer.
2. For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.

B. 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: For glazed aluminum curtain walls, for tests performed by a qualified testing agency.

D. Source quality-control reports.

E. Field quality-control reports.

F. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

B. Maintenance Data for Structural Sealant: For structural-sealant-glazed curtain walls to include in maintenance manuals. Include ASTM C1401 recommendations for post-installation-phase quality-control program.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated and acceptable to Owner and Architect.

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.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

D. Structural-Sealant Glazing: Comply with ASTM C1401 for design and installation of structural-sealant-glazed curtain wall assemblies.

1.6 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 WARRANTY

- A. Special Assembly Warranty: Installer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design glazed aluminum curtain walls.
- B. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure, including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 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 1/360 of clear span or 1/8 inch, whichever is smaller.
- E. Structural: Test in accordance with ASTM E330/E330M as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10seconds.
- F. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.
- G. Energy Performance: Certified and labelled by manufacturer for energy performance as follows:
1. Thermal Transmittance (U-factor):
 - a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.46 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.
 2. Solar Heat Gain Coefficient (SHGC):

- a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.29 as determined in accordance with NFRC 200.
 3. Air Leakage:
 - a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a static-air-pressure differential of [1.57 lbf/sq. ft. when tested in accordance with ASTM E283.
 4. Condensation Resistance Factor (CRF):
 - a. Fixed Glazing and Framing Areas: CRF for the system of not less than 29 as determined in accordance with AAMA 1503.
 - H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
 - I. Structural-Sealant Joints:
 1. Designed to carry gravity loads of glazing.
 - J. Structural Sealant: ASTM C1184. Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed curtain walls without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
 1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
 2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate, because sealant-to-substrate bond strength exceeds sealant's internal strength.
- 2.2 SOURCE LIMITATIONS
- A. Obtain all components of curtain-wall system, including framing, entrances, sun control, and accessories, from single manufacturer.
- 2.3 GLAZED ALUMINUM CURTAIN WALL SYSTEMS
- A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer North America; 1600 Wall System 2 or comparable product by one of the following:
 1. EFCO Corporation.
 2. Graham Architectural Products Corporation.
 3. Oldcastle, Inc.
 4. Pittco Architectural Metals, Inc.
 5. TRACO, a division of Kawneer.
 6. Tubelite Inc.
 7. U.S. Aluminum; a brand of C.R. Laurence.
 8. Wausau Window and Wall Systems; Apogee Wausau Group, Inc.
 9. YKK AP America Inc.

- B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally broken.
 - 2. Glazing System: Retained mechanically with gaskets on two sides and structural sealant on two sides.
 - 3. Glazing Plane: Front.
 - 4. Finish: Superior performance organic finish.
 - 5. Fabrication Method: Either factory- or field-fabricated system.
 - 6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 7. Steel Reinforcement: As required by manufacturer.
 - C. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.
 - 1. Include snap-on aluminum trim that conceals fasteners.
 - D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
 - E. Insulated Spandrel Panels:
 - 1. Laminated, metal-faced flat panels with no deviations in plane exceeding 0.8 percent of panel dimension in width or length.
 - a. Overall Panel Thickness: 1 inch.
 - b. Exterior Skin: Aluminum.
 - 1) Thickness: Manufacturer's standard for finish and texture indicated.
 - 2) Finish: Matching curtain-wall framing.
 - 3) Texture: Smooth.
 - 4) Backing Sheet: 1/8-inch- thick, tempered hardboard.
 - c. Interior Skin: Aluminum.
 - 1) Thickness: Manufacturer's standard for finish and texture indicated.
 - 2) Finish: Matching curtain-wall framing.
 - 3) Texture: Smooth.
 - 4) Backing Sheet: 1/8-inch- thick, tempered hardboard.
 - d. Thermal Insulation Core: Manufacturer's standard.
 - e. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1) Flame-Spread Index: 25 or less.
 - 2) Smoke-Developed Index: 50 or less.
 - F. Entrance Door Systems: Comply with Section 08 42 13 "Aluminum-Framed Entrances".
- 2.4 MULLION CAP EXTENSION
- A. Basis-of-Design Product: Kawneer Double Tapered Cover.
 - 1. Orientation: Vertical.

2. Projection from Wall: 7.5-inches.
3. Outriggers Shape: As indicated on the drawings.
4. Finish: Match adjacent glazed aluminum curtain wall.
5. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
6. Steel Reinforcement: As required by manufacturer.

2.5 GLAZING

- A. Glazing: Comply with Section 08 80 00 "Glazing."
- B. Glazing Gaskets: ASTM C509 or ASTM C864. Manufacturer's standard.
 1. Color: Black.
- C. Glazing Sealants: As recommended by manufacturer. Comply with Section 08 80 00 "Glazing."
 1. Sealant shall have a VOC content of 250 g/L or less.
 2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Structural Glazing Sealants: ASTM C1184, chemically curing silicone formulation that is compatible with system components with which it comes into contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in curtain-wall assembly indicated.
 1. Color: Black.
- E. Weatherseal Sealants: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes into contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed curtain-wall manufacturers for this use.
 1. Color: Match structural sealant.

2.6 MATERIALS

- A. Sheet and Plate: ASTM B209.
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
- C. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
- D. Structural Profiles: ASTM B308/B308M.
- E. Steel Reinforcement:
 1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

- F. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.
- G. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.7 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

2.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from exterior.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Fabricate components to resist water penetration as follows:
 - 1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
- E. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard assembly method.
- F. Factory-Assembled Frame Units:
1. Rigidly secure nonmovement joints.
 2. Prepare surfaces that are in contact with structural sealant in accordance with sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
 3. Seal joints watertight unless otherwise indicated.
 4. Install glazing to comply with requirements in Section 08 80 00 "Glazing."
 5. Install structural glazing.
 - a. Set glazing into framing in accordance with sealant manufacturer and framing Manufacturer's written instructions and standard practice. Use a spacer or backer as recommended by manufacturer.
 - b. Set glazing with proper orientation so that coatings face exterior or interior as specified.
 - c. Apply structural silicone sealant to completely fill cavity, in accordance with sealant manufacturers written instructions with the framing and glazing in a fully supported position.
 - d. Brace or stiffen framing and glazing in such a manner to prevent undue stresses on the glass edge seal and structural joints or movement of the glazing, until sealant is fully cured in accordance with Manufacturer's recommendations.
 - e. After structural sealant has completely cured, insert backer rod between lites of glass as recommended by sealant manufacturer.
 - f. Install weatherseal sealant to completely fill cavity, in accordance with sealant manufacturer's written instructions, to produce weatherproof joints.
 - g. Clean and protect glass as indicated in Section 08 80 00 "Glazing."
 - h. Retain bracing or stiffening until erected to prevent racking of units during transportation and erection.
- G. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.
- 2.9 ALUMINUM FINISHES
- A. Superior-Performance Organic Finish, Three-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 2. Color and Gloss: Black. Provide gloss options for Architect to select.

2.10 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C1401 recommendations, including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions.
- B. Do not install damaged components.
- C. Fit joints to produce hairline joints free of burrs and distortion.
- D. Rigidly secure nonmovement joints.
- E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
- G. Seal joints watertight unless otherwise indicated.
- H. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- I. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
- J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF GLAZING

- A. Install glazing as specified in Section 08 80 00 "Glazing."

3.4 INSTALLATION OF STRUCTURAL GLAZING

- A. Prepare surfaces that will contact structural sealant in accordance with sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
- B. Set glazing into framing in accordance with sealant manufacturer's and framing Manufacturer's written instructions and standard practice. Use a spacer or backer as recommended by manufacturer.
- C. Set glazing with proper orientation, so that coatings face exterior or interior as specified.
- D. Hold glazing in place using temporary retainers of type and spacing recommended by manufacturer, until structural sealant joint has cured.
- E. Apply structural sealant to completely fill cavity, in accordance with sealant manufacturer's and framing manufacturer's written instructions and in compliance with local codes.
- F. Apply structural sealant at temperatures indicated by sealant manufacturer for type of sealant.
- G. Allow structural sealant to cure in accordance with Manufacturer's recommendations.
- H. Clean and protect glass as indicated in Section 08 80 00 "Glazing."

3.5 INSTALLATION OF WEATHERSEAL SEALANT

- A. After structural sealant has completely cured, remove temporary retainers and insert backer rod between lites of glass, as recommended by sealant manufacturer.
- B. Install weatherseal sealant to completely fill cavity, in accordance with sealant manufacturer's written instructions, to produce weatherproof joints.

3.6 ERECTION TOLERANCES

- A. 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.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Test Area: Perform tests on representative areas of glazed aluminum curtain walls.
- C. Field Quality-Control Testing: Perform the following test on representative areas of glazed aluminum curtain walls.
 - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested in accordance with AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of three tests in areas as directed by Architect.
 - b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
 - 2. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
 - a. Perform a minimum of two tests in areas as directed by Architect.
 - b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
 - 3. Water Penetration: ASTM E1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.
- D. Structural-Sealant Adhesion: Test structural sealant in accordance with recommendations in ASTM C1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
 - 1. Test a minimum of four areas on each building facade.
 - 2. Repair installation areas damaged by testing.
- E. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

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 commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. 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.
 - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
 - 2. Division 08 Section "Flush Wood Doors".
 - 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
 - 4. Division 28 Section "Access Control Hardware Devices".
- 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. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series.

2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 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.
 - h. Warranty information for each product.
 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. Shop Drawings: Details of electrified access control hardware indicating the following:
 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

- a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
1. 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, Closeout Procedures.

1.4 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. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door 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.
- D. 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 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.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source 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.
- F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." 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.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
1. Prior to installation of door hardware, conduct 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
- I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.
- 1.5 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".

1.6 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: 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.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. 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. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

1.8 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.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. 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:
 - 1. 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.
- C. 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 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity:
 - 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 .
 - 2. 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 .
 - 3. 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.
 - 4. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
 - 5. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, 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 all out-swinging lockable doors.
 - 6. Manufacturers:
 - a. Hager Companies (HA).
 - b. Lawrence Brothers (LA).

- c. McKinney Products (MK).
 - B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
 1. Manufacturers:
 - a. Bommer Industries (BO).
 - b. Pemko Products (PE).
 - c. Select Hinges (SL).
 - C. Floor Closers: ANSI/BHMA A156.4 floor closers. Provide independent and adjustable valves for closing speed, latch speed, and backcheck with built-in dead stop and hold open features as specified. Provide finished cover plates or thresholds as indicated in door Hardware Sets.
 1. Heavy duty floor closers shall have a 10-year warranty..
 2. Manufacturers:
 - a. Dorma Products (DO).
 - b. Jackson Corporation (JA).
 - c. Rixson (RF).
 - D. Pivots: ANSI/BHMA A156.4, Grade 1; space intermediate pivots equally not less than 25 inches on center apart or not more than 35 inches on center for doors over 121 inches high. Pivot hinges to have oil impregnated bronze bearing in the top pivot and a radial roller and thrust bearing in the bottom pivot with the bottom pivot designed to carry the full weight of the door. Pivots to be UL listed for windstorm where applicable.
 1. Manufacturers:
 - a. Accurate Lock and Hardware (AC).
 - b. Architectural Builders Hardware (AH).
 - c. Rixson (RF).
- 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 with a 1-year warranty. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
 1. Manufacturers:
 - a. Hager Companies (HA) - ETW-QC (# wires) Option.
 - b. Lawrence Brothers (LA) - (# wires) Option.
 - c. McKinney Products (MK) - QC (# wires) Option.
 - B. Electrified Quick Connect Intermediate Transfer Pivots: Provide electrified offset intermediate transfer pivot 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. Manufacturers:
 - a. Accurate Lock and Hardware (AC) - (# wires).
 - b. Architectural Builders Hardware (AH) - EL019-EZ (# wires).
 - c. Rixson (RF) - E-M19-QC (# wires).

- C. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish 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. Manufacturers:
 - a. Architectural Builders Hardware (AH) - PT1000-EZ Series.
 - b. Pemko Products (PE) - EL-CEPT Series.
 - c. Securitron (SU) - EL-CEPT Series.

- D. Electric Door Wire Harnesses: Provide electric/data 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 and type 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. Provide one each of the following tools as part of the base bid contract:
 - a. McKinney Products (MK) - Electrical Connecting Kit: QC-R001.
 - b. McKinney Products (MK) - Connector Hand Tool: QC-R003.
2. Manufacturers:
 - a. Hager Companies (HA) - Quick Connect.
 - b. McKinney Products (MK) - QC-C Series.

- E. Provide mortar guard enclosure on steel frames installed at masonry openings for each electrical hinge specified.

2.4 DOOR OPERATING TRIM

- A. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
2. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.

3. Pulls, where applicable, shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
5. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products (RO).
 - c. Trimco (TC).

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.
 1. Manufacturers:
 - a. Medeco (MC).
 - b. To Match Existing
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 4. 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.
 5. Keyway: Match Facility Standard.
- C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. Existing System: Field verify and key cylinders to match Owner's existing system.
- E. Key Quantity: Provide the following minimum number of keys:
 1. Change Keys per Cylinder: Three (3) each.
 2. Master Keys (per Master Key Level/Group): Five (5) each.
 3. Construction Keys): Ten (10) each.
 4. Construction Control Keys: Two (2) each.
 5. Permanent Control Keys: Two (2) each.

- F. Construction Keying: Provide temporary keyed brass construction cores.
- G. Key Registration List (Bitting List):
 - 1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 - 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
 - 1. Heavy duty mortise locks shall have a ten-year warranty.
 - 2. Where specified, provide status indicators with highly reflective color and wording for "locked/unlocked" or "vacant/occupied" with custom wording options if required. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status. Indicator window size to be a minimum of 2.1" x 0.6" with a curved design allowing a 180-degree viewing angle with protective covering to prevent tampering.
 - 3. Manufacturers:
 - a. Sargent Manufacturing (SA) - 8200 Series.
 - b. To Match Existing.
- B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed.
 - 1. Locks shall meet or exceed the requirements of ANSI/BHMA A156.2 Series 4000, Grade 1 with all standard trims, as follows:
 - a. Cycle Test: ANSI/BHMA A156.2 Grade 1 requirements with no lever sag.
 - b. Abusive Locked Lever Torque: Exceed 3,100 in-lb with no entry; lock to maintain egress functionality in compliance with BHMA certification requirements.
 - c. Offset Lever Pull: Exceed 1,600 lbs with no entry (8 times ANSI/BHMA A156.2 requirements).
 - d. Latch Retraction with Preload: Exceed 100 lb preload while maintaining ANSI/BHMA requirements for operation in warped doors (2 times ANSI/BHMA A156.2 requirements).
 - 2. Heavy duty cylindrical locks shall have a seven-year warranty.
 - 3. Vertical Impact: Exceed 100 vertical impacts (20 times ANSI/BHMA A156.2 requirements).
 - 4. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
 - 5. Locks are to be non-handed and fully field reversible.
 - 6. Manufacturers:
 - a. Sargent Manufacturing (SA) - 10X Line.
 - b. To Match Existing.

- C. Knurling: Where required by local code provide knurling or abrasive coating to all levers on doors leading to hazardous areas such as mechanical rooms, boiler and furnace rooms, janitor closets, and as otherwise required or specified.

2.7 ELECTROMECHANICAL LOCKING DEVICES

- A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty, High Security Monitoring): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed, subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below.
 - 1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.
 - 2. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
 - 3. High Security Monitoring: Provide lock bodies which have built-in request to exit monitoring and are provided with accompanying door position switches. Provide a resistor configuration which is compatible with the access control system.
 - 4. Manufacturers:
 - a. Sargent Manufacturing (SA) - NAC 8200 Series.
 - b. To Match Existing.

2.8 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.

2.9 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
 2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 6. Flush End Caps: Provide flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
 7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 11. Rail Sizing: Provide exit device rails factory sized for proper door width application.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
 - a. Sargent Manufacturing (SA) - 80 Series.
 - b. To Match Existing.

2.10 ELECTROMECHANICAL EXIT DEVICES

- A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.
1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
 2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.
 3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
 4. Manufacturers:
 - a. Sargent Manufacturing (SA) - 80 Series.
 - b. To Match Existing.

2.11 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.
 2. Standards: Closers to comply with UL-10C 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 Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty 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 and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 25-year warranty.
 2. Manufacturers:
 - a. Sargent Manufacturing (SA) - 351 Series.
 - b. To Match Existing.
 - C. Door Closers, Surface Mounted (Cam Action): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, high efficiency 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 of the cam and roller design, one piece cast aluminum silicon alloy body with adjustable backcheck and independently controlled valves for closing sweep and latch speed.
 1. Manufacturers:
 - a. Sargent Manufacturing (SA) - 422 Series.
 - b. To Match Existing.
- 2.12 SURFACE MOUNTED CLOSER HOLDERS
- A. Electromagnetic Door Holders: ANSI A156.15 electromagnetic door holder/releases with a minimum 20 to 40 pounds holding power and single coil construction able to accommodate 12VDC, 24VAC, 24VDC and 120VAC. Coils to be independently wound, employing an integral fuse and armatures to include a positive release button.
 1. Manufacturers:
 - a. Folger Adam (FO) - Series.
 - b. Rixson (RF) - 980/990 Series.
 - c. Sargent Manufacturing (SA) - 1560 Series.
- 2.13 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 of single doors and 1" LDW on stop side of pairs of doors, 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. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
 4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inchthick.
 5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
 6. Manufacturers:
 - a. Hiawatha, Inc. (HI).

- b. Rockwood Products (RO).
- c. Trimco (TC).

2.14 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 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. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products (RO).
 - c. Trimco (TC).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed 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. Manufacturers:
 - a. Norton Rixson (RF).
 - b. Rockwood Products (RO).
 - c. Sargent Manufacturing (SA).

2.15 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 NPFA 252, Standard Methods of 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.

- 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. Manufacturers:
 - 1. National Guard Products (NG).
 - 2. Pemko Products (PE).
 - 3. Reese Enterprises, Inc. (RE).

2.16 ELECTRONIC ACCESSORIES

- A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
 - 1. Manufacturers:
 - a. Sargent Manufacturing (SA) - 3280 Series.
 - b. Security Door Controls (SD) - DPS Series.
 - c. Securitron (SU) - DPS Series.
- B. Switching Power Supplies: Provide power supplies with either single or dual voltage configurations at 12 or 24VDC. Power supplies shall have battery backup function with an integrated battery charging circuit and shall provide capability for power distribution, direct lock control and Fire Alarm Interface (FAI) through add on modules. Power supplies shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs.
 - 1. 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.
 - 2. Manufacturers:
 - a. Securitron (SU) - AQD Series.

2.17 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.

2.18 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.

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. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 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. 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.

- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. 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 (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

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. 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 SETS

- 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.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

Set: 1 – Stair

Doors: 1600A

2 Hinge	T4A3786 4-1/2" x 4-1/2" NRP	US26D	MK
1 Electric Hinge	T4A3786 4-1/2" x 4-1/2" QC-12	US26D	MK
<i>(Install at middle hinge)</i>			
1 ElectroLynx Harness	QC-C1500P		MK
<i>(Install between electric hinge and junction box)</i>			
1 Electrified Exit Device (Fail Safe)	43 64 LD AD8573 F x 773 ETP x CMK x 24VDC		
	US32D	SA	
1 ElectroLynx Harness	QC-CXXX x required length		MK
<i>(Install between electric hinge and electrified exit device)</i>			
1 Permanent Core	To match existing key system x MK	26	MC
1 Closer/Stop	351 CPS x 581-2	EN	SA
1 Mounting Plate	351-D	EN	SA
1 Card Reader	Furnished and installed by security contractor		
	OT		
1 Door Position Switch	DPS-M-BK		SU
1 Power Supply	AQD4		SU
1 Wiring Diagram	WD-SYSPK		SA

Card reader to be used by authorized persons to gain entry from the pull side of the opening

Card reader to be used to unlock the pull side lever of the electrified exit device

Push bar of the electrified exit device always free for immediate egress

Set: 2 – Auditorium Vestibule

Doors: 1600B, 1600C

6 Hinge	T4A3786 5" x 4-1/2" NRP	US26D	MK
1 Exit Device	16 31 43 64 NB8713 E x 713-8 ETP x 2" thick	US32D	SA
	door x CMK		
1 Exit Device	16 31 43 64 NB8710 E x 710 ETP x 2" thick		
	CMK	US32D	SA
3 Permanent Core	To match existing key system x MK	26	MC
2 Pocket Closer	351 OTP	EN	SA
2 Kickplate	K1050 10" x 1" LDW 4BE CSK	US32D	RO
2 Door Stop	481	US26D	RO
1 Gasketing (Set)	S88 BL x DOW x DOH		PE
1 Astragal (Set)	(2) 297 AS x DOH		PE
2 Electromagnetic Holder	1561 x 24VDC	EN	SA

Electromagnetic holders to be tied into the building fire alarm system

Set: 3 – Auditorium Vestibule

Doors: 1600D, 1600E

6 Hinge	T4A3786 5" x 4-1/2" NRP	US26D	MK
1 Exit Device	16 31 43 64 NB8713 F x 713-8 ETP x 2" thick		
US32D	SA		
	door x CMK		
1 Exit Device	16 31 43 64 NB8710 F x 710 ETP x 2" thick door x		
US32D	SA		
	CMK		
3 Permanent Core	To match existing key system x MK	26	MC
2 Pocket Closer	351 OTP	EN	SA
2 Kickplate	K1050 10" x 1" LDW 4BE CSK	US32D	RO
2 Door Stop	481	US26D	RO
1 Gasketing (Set)	S88 BL x DOW x DOH		PE
1 Astragal (Set)	(2) 297 AS x DOH		PE
2 Electromagnetic Holder	1561 x 24VDC	EN	SA
	Electromagnetic holders to be tied into the building fire alarm system		

Set: 4 – Exterior Entry

Doors: 1601A, 1601B, 1601L, 1601M

1 Floor Closer	27NHO x 90 deg x SC x less floor plate		626
RF			
3 Intermediate Pivot	M19	626	RF
1 Exit Device	16 43 64 AD8510 G x CMK	US32D	SA
1 Permanent Core	To match existing key system x MK	26	MC
1 Pull	RM2240 x 24" x Type 12XHD mounting		
US32D	RO		
1 Overhead Stop	69XS x 90 deg	US26D	SA
1 Threshold	Type 5 x 400 x DOW x 1/4-20 ms & la		AL
RF			
1 Door Bottom Seal	345 AV x DOW		PE
1 Drip Strip	346 C x DOW + 4"		PE
1 Door Position Switch	DPS-M-BK		SU
	Gasketing furnished by frame manufacturer		

Set: 4.1 – Exterior Entry

Doors: 1601C, 1601K

1 Floor Closer RF	27NHO x 90 deg x SC x less floor plate	626	
2 Intermediate Pivot	M19	626	RF
1 Electric Intermediate Pivot <i>(Install at middle pivot-active leaf only)</i>	E-M19 x QC-12	626	RF
1 ElectroLynx Harness <i>(Install between electric intermediate pivot and junction box)</i>	QC-C1500P		MK
1 Electric Latch Retraction Exit Device (Fail AD8504 G x less pull x CMK x 24VDC Secure)	US32D	16 43 56 64	SA
1 ElectroLynx Harness <i>(Install between electric intermediate pivot and electric latch retraction exit device)</i>	QC-CXXX x required length		MK
2 Permanent Core	To match existing key system x MK	26	MC
1 Pull US32D	RM2240 x 24" x Type 12XHD mounting RO		
1 Overhead Stop	69XS x 90 deg	US26D	SA
1 Threshold RF	Type 5 x 400 x DOW x 1/4-20 ms & la		AL
1 Door Bottom Seal	345 AV x DOW		PE
1 Drip Strip	346 C x DOW + 4"		PE
1 Card Reader OT	Furnished and installed by security contractor		
1 Door Position Switch	DPS-M-BK		SU
1 Door Position Switch	DPS-W-BK		SU
1 Wiring Diagram	WD-SYSPK		SA

Gasketing furnished by frame manufacturer

Card reader to be used by authorized persons to gain entry from the exterior side of the opening

Card reader to be used to retract the latch of the electric latch retraction exit device

Push bar of the electric latch retraction exit device always free for immediate egress

Set: 4.2 – Entry Vestibule

Doors: 1601D, 1601E, 1601F, 1601G, 1601H, 1601J

1 Floor Closer	27NHO x 90 deg x less floor plate	626	RF
3 Intermediate Pivot	M19	626	RF
1 Dummy Push Bar	43 8893 J	US32d	RO
1 Pull	RM2240 x 24" x Type 12HD mounting	US32D	RO
1 Overhead Stop	69XS x 90 deg	US26D	SA
1 Threshold RF	Type 5 x 400 x DOW x 1/4-20 ms & la		AL
1 Door Bottom Seal	321 CN x DOW		PE

Gasketing furnished by frame manufacturer

Set: 5 – Guest Services

Doors: 1601AA

3 Hinge	T4A3786 4-1/2" x 4-1/2" NRP	US26D	MK
1 Communicating Lockset	64 10XG30 LP x CMK	US26D	SA
2 Permanent Core	To match existing key system x MK	26	MC
1 Closer	422 CTB2	EN	SA
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1 Wall Stop	406	US32D	RO
3 Silencer	608-RKW		RO

Set: 6 – Coats/Pantry

Doors: 1601BB, 1605C

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Classroom Lockset	64 10XG37 LP x CMK	US26D	SA
1 Permanent Core	To match existing key system x MK	26	MC
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1 Mop Plate	K1050 4" x 1" LDW 4BE CSK	US32D	RO
<i>(For door 1605C only)</i>			
1 Wall Stop	406	US32D	RO
1 Door Stop	481	US26D	RO
<i>(For door 1605C only)</i>			
3 Silencer	608-RKW		RO

Set: 7 – Exterior Green Room

Doors: 1602

1 Continuous Hinge	CFM79HD1		PE
1 Power Transfer	EL-CEPT		SU
1 ElectroLynx Harness	QC-C1500P		MK
<i>(Install between power transfer and junction box)</i>			
1 Electric Latch Retraction Exit Device (Fail 8804 F x 704 ETP x CMK x 24VDC Secure)	US32D	43 56 64 LD SA	
1 ElectroLynx Harness	QC-CXXX x required length		MK
<i>(Install between power transfer and electric latch retraction exit device)</i>			
1 Permanent Core	To match existing key system x MK	26	MC
1 Closer	351 PD10	EN	SA
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1 Overhead Stop	59XS x 90 deg	US26D	SA
1 Threshold	171 A x DOW x MS & ES25		PE
1 Gasketing (Set)	316 AS x DOW x DOH		PE
1 Door Bottom Seal	345 AV x DOW		PE
1 Drip Strip	346 C x DOW + 4"		PE
1 Card Reader OT	Furnished and installed by security contractor		
1 Door Position Switch	DPS-M-BK		SU
1 Power Supply	AQD4		SU
1 Wiring Diagram	WD-SYSPK		SA

Card reader to be used by authorized persons to gain entry from the exterior side of the opening

Card reader to be used to retract the latch of the electric latch retraction exit device

Push bar of the electric latch retraction exit device always free for immediate egress

Set: 8 – Club/Dressing

Doors: 1603A, 1604A, 1612A, 2602A, 2603A, 3602A, 3603A			
2 Hinge	T4A3786 4-1/2" x 4-1/2"	US26D	MK
1 Electric Hinge	T4A3786 4-1/2" x 4-1/2" QC-12	US26D	MK
<i>(Install at middle hinge)</i>			
1 ElectroLynx Harness	QC-C1500P		MK
<i>(Install between electric hinge and junction box)</i>			
1 Mortar Box	MG-16		MK
1 Electrified Lockset (Fail Secure)	64 NAC-82271 LNP x CMK x 24VDC	US26D	SA
1 ElectroLynx Harness	QC-CXXX x required length'		MK
<i>(Install between electric hinge and electrified lockset)</i>			
1 Permanent Core	To match existing key system x MK	26	MC
1 Closer	422 CTB2	EN	SA
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1 Mop Plate	K1050 4" x 1" LDW 4BE CSK	US32D	RO
1 Wall Stop	406	US32D	RO
1 Door Stop	481	US26D	RO
<i>(For door 1604A only)</i>			
3 Silencer	608-RKW		RO
1 Card Reader	Furnished and installed by security contractor		
OT			
1 Power Supply	AQD4		SU
1 Wiring Diagram	WD-SYSPK		SA
Card reader to be used by authorized persons to gain entry from the push side of the opening			
Card reader to be used to unlock the push side lever of the electrified lockset			
Pull side lever of the electrified lockset always free for immediate egress			

Set: 9 – Toilet

Doors: 1603B, 1604B, 1604D, 2602B, 2603B, 2603C, 3602B, 3603B, 3603C			
3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Privacy Set & Indicator	8265 LNP x V21 x EMB	US26D	SA
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1 Mop Plate	K1050 4" x 1" LDW 4BE CSK	US32D	RO
1 Wall Stop	406	US32D	RO
3 Silencer	608-RKW		RO

Set: 10 – Club Toilet

Doors: 1605A, 1605D, 1611			
4 Hinge	T4A3786 4-1/2" x 4-1/2"	US26D	MK
1 Privacy Set & Indicator	8265 LNP x V21 x EMB	US26D	SA
1 Closer	422 CTB2	EN	SA
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1 Mop Plate	K1050 4" x 1" LDW 4BE CSK	US32D	RO
1 Wall Stop	406	US32D	RO
3 Silencer	608-RKW		RO

Set: 11 – Mechanical Room

Doors: 1605B

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom Lockset	64 10XG04 LP x CMK	US26D	SA
1 Permanent Core	To match existing key system x MK	26	MC
1 Closer	351 O	EN	SA
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1 Door Stop	481	US26D	RO
1 Threshold	151A x DOW x MS & ES25		PE
1 Gasketing (Set)	S88 BL x DOW x DOH		PE
1 Automatic Door Bottom	434 APKL x DOW		PE

Set: 11.1 – Mechanical Room

Doors: 1613, 1621, 2601, 2603D, 3600, 3601

3 Hinge	TA2714 4-1/2" x 4-1/2" NRP	US26D	MK
1 Storeroom Lockset	64 10XG04 LP x CMK	US26D	SA
1 Permanent Core	To match existing key system x MK	26	MC
1 Closer/Stop	351 CPS	EN	SA
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1 Threshold	151A x DOW x MS & ES25		PE
1 Gasketing (Set)	S88 BL x DOW x DOH		PE
1 Automatic Door Bottom	434 APKL x DOW		PE

Set: 12 – Club

Doors: 1605E

8 Hinge	T4A3786 5" x 4-1/2" NRP	US26D	MK
1 Exit Device	16 43 64 NB AD8413 J x 713-4 ETP x CMK		
	US32D	SA	
1 Exit Device	16 43 64 NB AD8410 J x 710 ETP x CMK		
	US32D	SA	
3 Permanent Core	To match existing key system x MK	26	MC
2 Closer/Holder	351 CPSH x 581-2	EN	SA
2 Mounting Plate	351-D	EN	SA
1 Astragal (Set)	(2) 297 AS x DOH		PE

Set: 13 – Club

Doors: 1605G, 1605H

4 Hinge	T4A3786 5" x 4-1/2" NRP	US26D	MK
1 Exit Device	16 43 64 AD8513 G x 713 ETP x CMK	US32D	SA
2 Permanent Core	To match existing key system x MK	26	MC
1 Closer/Holder	351 CPSH x 581-2	EN	SA
1 Mounting Plate	351-D	EN	SA

Set: 14 – Janitor/Storage

Doors: 1606B, 1607B, 1609A, 1610A

3 Hinge	TA2714 4-1/2" x 4-1/2" NRP	US26D	MK
1 Storeroom Lockset	64 10XG04 LP x CMK	US26D	SA
1 Permanent Core	To match existing key system x MK	26	MC
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
<i>(No kickplate required at door 1609A)</i>			
1 Wall Stop	406	US32D	RO
1 Overhead Stop	59XS x 90 deg	US26D	SA
<i>(For door 1609A and 1610A only)</i>			
3 Silencer	608-RKW		RO

Set: 14.1 – Closet

Doors: 1620

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom Lockset	64 10XG04 LP x CMK	US26D	SA
1 Permanent Core	To match existing key system x MK	26	MC
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1 Wall Stop	406	US32D	RO
3 Silencer	608-RKW		RO

Set: 15 – Utility

Doors: 1608

3 Hinge	TA2714 4-1/2" x 4-1/2" NRP	US26D	MK
1 Storeroom Lockset	64 10XG04 LP x CMK	US26D	SA
1 Permanent Core	To match existing key system x MK	26	MC
1 Closer	351 P10	EN	SA
1 Wall Stop	406	US32D	RO
3 Silencer	608-RKW		RO

Set: 16 – Exterior Club

Doors: 1612B

2 Pivot (Set)	147	626	RF
4 Intermediate Pivot	M19	626	RF
1 Exit Device	16 43 64 AD8410 J x 106 x less pull x CMK		
	US32D	SA	
1 Exit Device	16 43 64 AD8410 J x CMK	US32D	SA
3 Permanent Core	To match existing key system x MK	26	MC
2 Pull	RM2240 x 24" x Type 12XHD mounting		
	US32D	RO	
2 Closer	351 P10 x 581-2	EN	SA
2 Mounting Plate	351-D	EN	SA
2 Overhead Stop	69XS x 90 deg	US26D	SA
1 Threshold	170 A x DOW x MS & ES25		PE
2 Door Bottom Seal	345 AV x DOW		PE
1 Astragal (Set)	(2) 297 AS x DOH		PE
1 Drip Strip	346 C x DOW + 4"		PE
2 Door Position Switch	DPS-M-BK		SU

Gasketing furnished by frame manufacturer

Set: 17 – Elevator Machine Room

Doors: 1622

3 Hinge	TA2714 4-1/2" x 4-1/2" NRP	US26D	MK
1 Storeroom Lockset	64 76 10XG04 LP x CMK	US26D	SA
1 Permanent Core	To match existing key system x MK	26	MC
1 Closer	351 P10	EN	SA
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1 Wall Stop	406	US32D	RO
1 Threshold	151A x DOW x MS & ES25		PE
1 Gasketing (Set)	S88 BL x DOW x DOH		PE
1 Automatic Door Bottom	434 APKL x DOW		PE

Set: 18 – Corridor Storage

Doors: 3604

3 Hinge	T4A3786 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom Lockset	64 10XG04 LP x CMK	US26D	SA
1 Permanent Core	To match existing key system x MK	26	MC
1 Closer	351 O	EN	SA
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1 Door Stop	481	US26D	RO
1 Gasketing (Set)	S88 BL x DOW x DOH		PE

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass products.
2. Insulating glass.
3. Glazing sealants.
4. Miscellaneous glazing materials.

B. Related Requirements:

1. Section 08 12 19 "Interior Aluminum Doors and Frames."
2. Section 08 83 00 "Mirrors."

1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch lengths.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

1. Qualification Data: For Installer.
- B. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors.
- B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 1. Install glazing in mockups specified in Section 08 44 13 "Glazed Aluminum Curtain Walls" to match glazing systems required for Project, including glazing methods.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.9 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Heat-Soaked Tempered Glass: Manufacturer agrees to replace heat-soaked tempered glass units that spontaneously break due to nickel sulfide (NiS) inclusions at a rate exceeding 0.3 percent (3/1000) within specified warranty period. Coverage for any other cause is excluded.
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AGC Glass Company North America, Inc.
 2. Cardinal Glass Industries.
 3. Cristacurva.
 4. Dlubak Corporation.
 5. Gardner Glass, Inc.
 6. GGI; General Glass International.
 7. Glasswerks LA, Inc.
 8. GTI; Glaz-Tech Industries.
 9. Guardian Glass; SunGuard.
 10. Hartung Glass Industries.
 11. JE Berkowitz, LP.
 12. Northwestern Industries, Inc.
 13. Oldcastle BuildingEnvelope™.
 14. Pilkington North America.
 15. Schott North America, Inc.
 16. Tecnoglass.
 17. Trulite Glass & Aluminum Solutions, LLC.
 18. Vetrotech Saint-Gobain.
 19. Viracon, Inc.
 20. Vitro Architectural Glass.
- B. Source Limitations for Glass: Obtain tinted and coated glass from single source from single manufacturer.
- C. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:
 - 1. Design Wind Pressures: As indicated on Drawings.
 - a. Wind Design Data: As indicated on Drawings.
 - 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
 - 3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- 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. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
 - 2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 - 3. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on LBL's WINDOW 7 computer program, expressed as Btu/sq. ft. x h x deg F.
 - 4. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on LBL's WINDOW 7 computer program.
 - 5. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. NGA Publications: "Glazing Manual."
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. 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 the IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- C. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.
 - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
 - 2. Perimeter Spacer: Manufacturer's standard spacer material and construction.
 - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.6 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of industry colors.

B. Neutral-Curing Silicone Glazing Sealant, Class 50: Complying with ASTM C920, Type S, Grade NS, Use NT.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks:

1. Type recommended in writing by sealant or glass manufacturer.

D. Spacers:

1. Type recommended in writing by sealant or glass manufacturer.

E. Edge Blocks:

1. Type recommended in writing by sealant or glass manufacturer.

F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 2. Presence and functioning of weep systems.
 3. Minimum required face and edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 2. Provide 1/8-inch- minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.5 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.

3.6 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other

masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.7 MONOLITHIC GLASS SCHEDULE

- A. GL- 4, Clear Glass Type: Tempered, float glass.
 1. Minimum Thickness: 10 mm or as indicated in individual technical sections.
 2. Location: Typical at interior glazing.

3.8 INSULATING GLASS SCHEDULE

- A. GL-1, Low-E-Coated, Clear Insulating Glass Type:
 1. Basis-of-Design Product: AGC Energy Select 23 Clear.
 2. Overall Unit Thickness: 1 inch.
 - a. Minimum Thickness of Each Glass Lite: 6 mm.
 - b. Outdoor Lite: Heat-strengthened float glass.
 - c. Interspace Content: Air.
 - d. Indoor Lite: Heat-strengthened float glass.
 - e. Low-E Coating: Sputtered on second surface.
 - f. Winter Nighttime U-Factor: 0.29 maximum.
 - g. Summer Daytime U-Factor: 0.26 maximum.
 - h. Visible Light Transmittance: 48% percent minimum.
 - i. SGHC: 0.25 maximum.
 3. Location: Typical Vision Glass Exterior IGU.
- B. GL-2, Low-E-Coated, Clear, Tempered Insulating Glass Type:
 1. Basis-of-Design Product: AGC Energy Select 23 Clear.
 2. Overall Unit Thickness: 1 inch.
 - a. Minimum Thickness of Each Glass Lite: 6 mm.
 - b. Outdoor Lite: Heat-strengthened float glass.
 - c. Interspace Content: Air.
 - d. Indoor Lite: Heat-strengthened float glass.
 - e. Low-E Coating: Sputtered on second surface.
 - f. Winter Nighttime U-Factor: 0.29 maximum.
 - g. Summer Daytime U-Factor: 0.26 maximum.
 - h. Visible Light Transmittance: 48% percent minimum.
 - i. SGHC: 0.25 maximum.
 3. Location: Typical Vision Glass Exterior IGU.

Bell Auditorium Expansion & Renovations
Block 2 Levels 16 & 17
Issue for Permit / Bid

Perkins&Will
222028.000
16 January 2023

END OF SECTION

SECTION 08 81 13

DECORATIVE GLASS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Back-painted glass.
 - 2. Glass with finished edges.
- B. Related Requirements:
 - 1. Section 08 83 00 "Mirrors" for mirror glass.

1.2 DEFINITION

- A. Glass Thickness: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For decorative glass. Show fabrication and installation details. Include the following:
 - 1. Size and location of penetrations.
 - 2. Glazing method.
 - 3. Mounting method.
 - 4. Attachments to other work.
 - 5. Full-size details of edge-finished profiles.
- C. Glass Samples: For the following products, 12 inches square:
 - 1. Each type of decorative glass.
 - 2. Each edge treatment on type of decorative glass.
 - 3. Each applied coating on type of decorative glass.
- D. Glazing Accessory Samples: For sealants, in 12-inch lengths.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of decorative glass.
- C. Preconstruction adhesion and compatibility test report.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of decorative glass and each applied coating to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under NGA's Certified Glass Installer Program.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect decorative glass and glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Retain packaging and sequencing numbers for decorative-glass units.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install decorative glass until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of openings and construction contiguous with decorative glass by field measurements before fabrication.

1.10 WARRANTY

- A. Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AGC Inc.
 - 2. Guardian Glass.
 - 3. McGrory Glass.
- B. Source Limitations for Glass: Obtain each type of decorative glass from single source from single manufacturer.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer, for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Decorative glass installed adjacent to walking surfaces shall withstand the following design loads within limits and under conditions indicated:
 - 1. Differential deflection of adjacent unsupported edges shall not exceed glass thickness when subjected to 50 lbf/ft. applied horizontally to one panel at any point up to 42 inches above the adjacent walking surface.
 - 2. Base design on thickness at thinnest part of the glass.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and "GANA's "Glazing Manual" unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

2.4 GLASS PRODUCTS

- A. Decorative Glass Type GPL-1: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear), Quality-Q3.
 - 1. Glass Thickness: 6.0 mm, unless otherwise noted.
 - 2. Color: Refer to Interior Finish Legend on Drawings.
 - 3. Gloss Finish: Glossy.
 - 4. Basis of Design Product: Refer to Interior Finish Legend on Drawings.
 - a. Acceptable Comparable Products:
 - 1) AGC Inc.; Lacobel.
 - 2) Guardian Glass; Guardian Deco HT.
 - 5. Comply with requirements for safety glazing.
 - 6. Paint: manufacturer's standard to match color and gloss finish specified.

2.5 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by decorative glass manufacturer.
- C. Glass bonding material: double-sided foam tape or single component, neutral, low modulus silicone adhesive/sealant recommended by the manufacturer.

2.6 DECORATIVE-GLASS FABRICATION

- A. Fabricate decorative glass and provide other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with product manufacturer's written instructions and with referenced glazing standard.
- B. Edge Finishing: Finish edges smooth and polished, without chips, scratches, or warps.
 - 1. Finished Edge: Flat polished.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine decorative-glass framing members, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Minimum required face or edge clearances.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate orientation of outer surfaces as indicated on Drawings. Label or mark units as needed so that surface orientation is readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 INSTALLATION

- A. Set decorative-glass units in each series true in line with uniform orientation, pattern, draw, bow, and similar characteristics.
- B. Set glass lites with proper orientation so that each outer surface faces the direction indicated on Drawings.
- C. Set decorative glass in locations indicated on Drawings. Install glass with hardware and accessories according to hardware manufacturer's written instructions. Attach hardware securely to mounting surfaces.
- D. Set decorative glass in locations indicated on Drawings.

3.4 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, gaskets, sealants, tapes, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- C. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

SECTION 08 83 00

MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following types of silvered flat glass mirrors:
 - 1. TA-12, Tempered glass mirrors.
 - 2. TA-13, laminated monolithic glass mirror.
- B. Related Requirements:
 - 1. Section 10 28 13 "Toilet Accessories" for metal-framed mirrors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.
- C. Samples: For each type of the following:
 - 1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
 - 2. Mirror Trim: 12 inches long.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For mirrors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.8 WARRANTY

- A. Special Warranty: Manufacturer 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Avalon Glass and Mirror Company.
 - 2. Binswanger Mirror; a division of Vitro America, Inc.
 - 3. Gardner Glass, Inc.
 - 4. Glasswerks LA, Inc.
 - 5. Guardian Glass; SunGuard.
 - 6. Independent Mirror Industries, Inc.
 - 7. National Glass Industries.
 - 8. Trulite Glass & Aluminum Solutions, LLC.
 - 9. Virginia Mirror Company, Inc.
 - 10. Walker Glass Co., Ltd.
- B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.
- C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

2.2 SILVERED FLAT GLASS MIRRORS

- A. Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.
- B. TA-12, Tempered Glass Mirrors: Mirror Glazing Quality for blemish requirements and complying with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear.
 - 1. Nominal Thickness: 6.0 mm unless indicated otherwise.
- C. TA-13, Laminated Mirrors: ASTM C 1172, Type II.
 - 1. Glass for Outer Lite: Annealed float glass, Mirror Select Quality, ultraclear (low-iron) float glass with a minimum 91 percent visible light transmission.
 - 2. Nominal Thickness for Outer Lite: 6.0 mm unless indicated otherwise.
 - 3. Glass for Inner Lite: Annealed float glass; ASTM C 1036, Type I (transparent flat glass), Quality-Q3; Class 1 (clear).
 - 4. Nominal Thickness: 6.0 mm unless indicated otherwise.
 - 5. Interlayer: Mirror manufacturer's standard 0.030-inch- (0.76-mm-) thick, clear polyvinyl-butylal interlayer with a proven record of showing no tendency to delaminate from, or cause damage to, silver coating.
- D. Safety Glazing Products: For laminated mirrors, provide products that comply with 16 CFR 1201, Category II.

2.3 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Laurence, C. R. Co., Inc.
 - b. Macco Adhesives.
 - c. Pecora Corporation.
 - d. Royal Adhesives & Sealants.
 - 2. Adhesives shall have a VOC content of 70 g/L or less.

2.4 MIRROR HARDWARE

- A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.
 - 1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Andscot Company, Inc.
 - 2) Laurence, C. R. Co., Inc.
 - 3) Stylmark, Inc.
2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.04 inch.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Andscot Company, Inc.
 - 2) Laurence, C. R. Co., Inc.
 - 3) Stylmark, Inc.
 3. Finish: Clear bright anodized.
- B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.
- 2.5 FABRICATION
- A. Fabricate mirrors in the shop to greatest extent possible.
 - B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
 - C. Mirror Edge Treatment: Flat polished.
 1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
 - 1. GANA Publications: "Laminated Glazing Reference Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- B. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 1. Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.
 - 2. Install mastic as follows:
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION

SECTION 08 87 33

DECORATIVE FILMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes film products applied to glass surfaces to impart the following characteristics:
 - 1. Privacy glazing surface films.

1.2 ACTION SUBMITTALS

- A. Product Data: Submit for each product specified indicating:
 - 1. Performance properties.
 - 2. Preparation and installation instructions and recommendations.
 - 3. Storage and handling recommendations.
- B. Samples: For each type of film specified, two (2) samples, 12 inches square.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Submit documentation indicating qualifications of film manufacturer.
- B. Warranty: Submit sample special warranty specified in this section.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of film to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that has a minimum of 05 years of documented experience manufacturing films similar to that used for this project.
- B. Installer Qualifications: A firm that is authorized by film manufacturer to install film in accordance with guidelines set forth by the manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials in manufacturer's protective packaging.
- B. Store and protect materials according to manufacturer's written recommendations to prevent damage from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install films until spaces are enclosed and weathertight, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to replace films that deteriorate within specified warranty period. Deterioration of film is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning film contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. GF, Basis-of-Design Products: Provide product listed in Finish Legend or comparable product by one of the following:
 - 1. LLumar Films.
 - 2. Solar Gard Window Films.
 - 3. 3M Window Films.
 - 4. Vista Window Films
- B. Source Limitations: Obtain each type of film from same manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Scratch Resistance: Decorative films shall average less than 12 percent increase in haze when tested according to ASTM D1044 using a Teledyne Taber Abrader using CS10F Type III wheels each loaded to 0.5 kg for 100 cycles in a 70 percent vacuum.
 - 1. Scratch resistance testing shall be performed by an independent third party agency.
- B. Peel Strength: >2720 (>6) grams/inch of width when tested in accordance with ASTM D3330.
- C. Surface Burning Characteristics: Provide films that have Flame Spread Index of 0 and Smoke Developed Index of 30 or less when tested in accordance with ASTM E84.
- D. Provide decorative films that do not have a masking sheet.

2.3 GLAZING FILM ACCESSORIES

- A. General: Provide accessories either manufactured by or acceptable to film manufacturer for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Pressure sensitive adhesive: This adhesive is activated by pressure and water. It is characterized by its permanently tacky nature and its installation ease.
- C. Cleaners, Primers, and Sealers: Types recommended by film manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements and for conditions affecting performance of film including glass that is broken, chipped, cracked, abraded, or damaged in any way.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates thoroughly prior to installation.
- C. Prepare substrates using methods recommended by film manufacturer to achieve the best results for the substrate under project conditions.
- D. Protect window frames and surrounding surfaces to prevent damage during installation.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's written instructions.
- B. Install film continuously, but not necessarily in one continuous length. Install with no gaps or overlaps.
- C. If seamed, make seams non-overlapping.
- D. Do not remove release liner from film until just before each piece of film is cut and ready for installation.
- E. Custom cut to the glass with neat, square corners and edges to within 1/8-inch of the window frame.
- F. Remove air bubbles, blisters, and other defects. Be careful to remove "fingers" to eliminate any contamination or excess water pockets. It is crucial to remove as much water as possible during installation.
- G. Perform final squeegee pass over the entire pane using a long blade with an extended handle design, as recommended by film manufacturer.

3.4 FIELD QUALITY CONTROL

- A. After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform in appearance with no visible streaks, wrinkles, banding, thin spots or pinholes.
- B. If installed film does not meet these criteria, remove and replace with new film.

3.5 CLEANING AND PROTECTION

- A. Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended by film manufacturer.
- C. Replace films that cannot be cleaned.
- D. Protect installed products until completion of project.
- E. Touch-up, repair or replace damaged products before substantial completion.

END OF SECTION

SECTION 08 91 19

FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fixed extruded-aluminum louvers.
 - 2. Blank-off panels for louvers

1.2 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).
- C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- D. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven-rain performance, as determined by testing according to AMCA 500-L.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
 - 1. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.
 - 2. Show mullion profiles and locations.
- C. Samples: For each type of metal finish required.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranties: For manufacturer's special warranties.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 WARRANTY

- A. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.
 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain fixed louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
 1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
- B. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Drainable-Blade Louver: Basis-of-Design: Refer to Mechanical Wall Louver Schedule.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance; a division of MESTEK, Inc.
 - b. Air Flow Company, Inc.
 - c. Airline Louvers; a division of Mestek, Inc.
 - d. Airolite Company, LLC (The).
 - e. All-Lite Architectural Products.
 - f. American Warming and Ventilating; a Mestek Architectural Group company.
 - g. Architectural Louvers; Harray, LLC.
 - h. Arrow United Industries.
 - i. Carnes Company.
 - j. Cesco Products; a division of MESTEK, Inc.
 - k. Construction Specialties, Inc.
 - l. DAMS Incorporated; D. Architectural Metal Solutions Incorporated.
 - m. Industrial Louvers Inc.
 - n. Louvers & Dampers, Inc.; a division of Mestek, Inc.
 - o. Metal Form Manufacturing, Inc.
 - p. NCA Manufacturing, Inc.
 - q. Pottorff.
 - r. Reliable Products, Inc.
 - s. Ruskin Company.
 - t. Safe Air - Dowco Products.
 - u. United Enertech.
 - v. Vent Products Co., Inc.
2. Louver Depth: 6 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
4. Mullion Type: Exposed.
5. Louver Performance Ratings:
 - a. Free Area: Not less than 8.5 sq. ft. for 48-inch- wide by 48-inch- high louver.
 - b. Point of Beginning Water Penetration: Not less than 950 fpm.
 - c. Air Performance: Not more than 0.10-inch wg static pressure drop at 750-fpm free-area velocity.

2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
 1. Screen Location for Fixed Louvers: Interior face.
 2. Screening Type: Insect screening.
- B. Secure screen frames to louver frames with machine screws with heads finished to match louver, spaced a maximum of 6 inches from each corner and at 12 inches o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same type and form of metal as indicated for louver to which screens are attached.
2. Finish: Mill finish unless otherwise indicated.
3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers:

1. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch wire.

2.5 BLANK-OFF PANELS

A. Insulated Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.

1. Thickness: 2 inches.
2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
3. Insulating Core: Rigid, glass-fiber-board insulation or extruded-polystyrene foam.
4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard channel frames, with corners mitered and with same finish as panels.
5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
6. Panel Finish: Same finish applied to louvers.

2.6 MATERIALS

- A. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B209 (ASTM B209M), Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
 3. For fastening galvanized steel, use hot-dip-galvanized-steel or 300 series stainless-steel fasteners.
 4. For fastening stainless steel, use 300 series stainless-steel fasteners.
 5. For color-finished louvers, use fasteners with heads that match color of louvers.
- D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, fabricated from stainless-steel components, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing according to ASTM E488/E488M conducted by a qualified testing agency.

- E. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.7 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing to produce uniform appearance.
- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
 - 1. Frame Type: Channel unless otherwise indicated.
- D. Include supports, anchorages, and accessories required for complete assembly.
- E. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.
 - 1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
 - 2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.
- F. Provide subsills made of same material as louvers or extended sills for recessed louvers.
- G. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.8 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: Match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

END OF SECTION

SECTION 09 21 16.23

GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes gypsum board shaft wall assemblies.

1.2 ACTION SUBMITTALS

- A. Product Data: For each component of gypsum board shaft wall assembly.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and support them on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Comply with gypsum-shaftliner-board manufacturer's written instructions.
- B. Do not install finish panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance for Shaft Walls:
 - 1. Intermittent Air Pressure (Elevators): Withstands minimum 5 lbf/sq.ft.
 - 2. Constant Air Pressure (HVAC): Withstands minimum 5 lbf/sq.ft.
 - 3. Deflection of Wall Assemblies: Maximum L/240.
- B. 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.

- C. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.
- D. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- E. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. Fire-Resistance Rating: As indicated.
- B. STC Rating: As indicated.
- C. Gypsum Shaftliner Board:
 - 1. Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with paper faces, 1 inch thick, with double beveled long edges.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) American Gypsum; Shaft Liner.
 - 2) CertainTeed Corp.; ProRoc Shaftliner.
 - 3) Continental Building Products, LLC.; Firecheck Type X Shaftliner.
 - 4) Georgia-Pacific Gypsum LLC, Subsidiary of Georgia Pacific; ToughRock Fireguard Shaftliner.
 - 5) National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner.
 - 6) PABCO Gypsum; Pabcore Shaftliner Type X.
 - 7) Temple-Inland Inc.; Fire-Rated SilentGuard Gypsum Shaftliner System.
 - 8) USG Corporation; Sheetrock Brand Gypsum Liner Panel.
 - 2. Moisture- and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with ASTM D 3273 mold-resistance score of 10 as rated according to ASTM D 3274, 1 inch thick, and with double beveled long edges.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) CertainTeed Corp.; ProRoc Moisture and Mold Resistant Shaftliner.
 - 2) Continental Building Products, LLC.; Firecheck Moldcheck Type X Shaftliner.
 - 3) Georgia-Pacific Gypsum LLC, Subsidiary of Georgia Pacific; Dens-Glass Ultra Shaftliner.
 - 4) National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner XP.
 - 5) PABCO Gypsum; Pabcore Mold Curb Shaftliner Type X.
 - 6) Temple-Inland Inc.; Fire-Rated SilentGuard TS Mold-Resistant Gypsum Shaftliner System.
 - 7) USG Corporation; Sheetrock Brand Mold Tough Gypsum Liner Panel.

- D. Non-Load-Bearing Steel Framing, General: Complying with ASTM C 645 requirements for metal unless otherwise indicated and complying with requirements for fire-resistance-rated assembly indicated.
 - 1. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized unless otherwise indicated.
- E. Studs: Manufacturer's standard profile for repetitive, corner, and end members as follows:
 - 1. Depth: As indicated.
 - 2. Minimum Base-Metal Thickness: 0.033 inch.
- F. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.
 - 1. Minimum Base-Metal Thickness: 0.033 inch.
- G. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fire Trak Corp.; Fire Trak System.
 - b. Grace Construction Products; FlameSafe FlowTrak System.
 - c. Metal-Lite, Inc.; The System.
 - d. Steel Network Inc. (The); VertiClip SLD Series.
- H. Finish Panels: Gypsum board as specified in Section 09 29 00 "Gypsum Board."
- I. Sound Attenuation Blankets: As specified in Section 09 29 00 "Gypsum Board."

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with shaft wall manufacturer's written instructions.
- B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 09 29 00 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written instructions for application indicated.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
- D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
 - 1. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Reinforcing: Galvanized-steel reinforcing strips with 0.033-inch minimum thickness of base metal (uncoated).

- F. Acoustical Sealant: Section 07 92 19 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 07 81 00 "Applied Fireproofing."
- B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

- A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated and manufacturer's written installation instructions.
- B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.
- C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
 - 1. Reinforcing: Provide where items attach directly to shaft wall assembly as indicated on Drawings; accurately position and secure behind at least one layer of face panel.
- D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons and floor indicators, and similar items.
- E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels while maintaining continuity of fire-rated construction.

- F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- G. Control Joints: Install control joints at locations indicated on Drawings and according to ASTM C 840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.
- H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.
- I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.4 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.
3. Grid suspension systems for gypsum board ceilings.

B. Related Requirements:

1. Section 05 40 00 "Cold-Formed Metal Framing" for exterior non-load-bearing wall studs and soffit framing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.4 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
 - 2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A653/A653M, G40, hot-dip galvanized unless otherwise indicated.
- C. Studs and Tracks: ASTM C645. Use either conventional steel studs and tracks or embossed, high-strength steel studs and tracks.
 - 1. Steel Studs and Tracks:
 - a. Minimum Base-Steel Thickness: 0.0329 inch.
 - b. Depth: As indicated on Drawings.
 - 2. Embossed, High Strength Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally comparable to conventional ASTM C645 steel studs and tracks.
 - a. Minimum Base-Steel Thickness: 0.0190 inch.
 - b. Depth: As indicated on Drawings.
- D. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Double-Track System: ASTM C645 top outer tracks, inside track with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
 - 2. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- E. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Steel Thickness: 0.0598 inch.
- G. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch-wide flanges.
 - 1. Depth: 1-1/2 inches.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- H. Hat-Shaped, Rigid Furring Channels: ASTM C645.
 - 1. Minimum Base-Steel Thickness: 0.0179 inch.
 - 2. Depth: 7/8 inch.

- I. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
 1. Depth: As indicated on Drawings.
 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
 3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- B. Hanger Attachments to Concrete:
 1. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.
 1. Depth: As indicated on Drawings.
- E. Furring Channels (Furring Members):
 1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
 2. Steel Studs and Tracks: ASTM C645.
 - a. Minimum Base-Steel Thickness: 0.0329 inch.
 - b. Depth: As indicated on Drawings.
 3. Embossed, High-Strength Steel Studs and Tracks: ASTM C645.
 - a. Minimum Base-Steel Thickness: 0.0190 inch.
 - b. Depth: As indicated on Drawings.
 4. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.
 - a. Minimum Base-Steel Thickness: 0.0179 inch.
- F. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong World Industries, Inc.
 - b. Rockfon (Rockwool International).
 - c. USG Corporation.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
 - 2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
 - 3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c.
 2. Carrying Channels (Main Runners): 48 inches o.c.
 3. Furring Channels (Furring Members): 24 inches o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Do not attach hangers to steel roof deck.
 5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

- E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.
3. Specialty reveal base.

B. Related Requirements:

1. Section 06 16 00 "Sheathing" for gypsum sheathing for exterior walls.
2. Section 07 92 19 "Acoustical Joint Sealants" for acoustical joint sealants installed in gypsum board assemblies.
3. Section 09 22 16 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Gypsum board, Type X.
2. Gypsum ceiling board.
3. Impact-resistant gypsum board.
4. Mold-resistant gypsum board.
5. Cementitious backer units.
6. Joint treatment materials.
7. Sound-attenuation blankets.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
2. Specialty reveal base, sample for initial selection: Provide 6-inch-long sample for each specified color for architect's review and selection.

1.3 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.

- b. Each texture finish indicated.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 1.4 DELIVERY, STORAGE AND HANDLING
- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.
- 1.5 FIELD CONDITIONS
- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
 - B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
 - C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

- 2.1 PERFORMANCE REQUIREMENTS
- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 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 E90 and classified according to ASTM E413 by an independent testing agency.
 - C. Ceiling and wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- 2.2 GYPSUM BOARD, GENERAL
- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

- B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C1396/C1396M.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum.
 - b. CertainTeed Gypsum.
 - c. Continental Building Products, LLC.
 - d. Georgia-Pacific Gypsum LLC.
 - e. National Gypsum Company.
 - f. PABCO Gypsum.
 - g. Panel Rey SA.
 - h. USG Corporation.

2. Thickness: 5/8 inch.

3. Long Edges: Tapered.

B. Gypsum Ceiling Board: ASTM C1396/C1396M.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum.
 - b. CertainTeed Gypsum.
 - c. Continental Building Products, LLC.
 - d. Georgia-Pacific Gypsum LLC.
 - e. National Gypsum Company.
 - f. PABCO Gypsum.
 - g. USG Corporation.

2. Thickness: 1/2 inch.

3. Long Edges: Tapered.

C. Impact-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum.
 - b. CertainTeed Gypsum.
 - c. Continental Building Products, LLC.
 - d. Georgia-Pacific Gypsum LLC.
 - e. National Gypsum Company.
 - f. PABCO Gypsum.
 - g. USG Corporation.

2. Core: 5/8 inch, Type X.

3. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 3 requirements.

4. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.

5. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 3 requirements.
 6. Hard-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 2 requirements according to test in Annex A1.
 7. Long Edges: Tapered.
 8. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
- D. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum.
 - b. CertainTeed Gypsum.
 - c. Continental Building Products, LLC.
 - d. Georgia-Pacific Gypsum LLC.
 - e. National Gypsum Company.
 - f. PABCO Gypsum.
 - g. USG Corporation.
 2. Core: 5/8 inch, Type X.
 3. Long Edges: Tapered.
 4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C-Cure.
 - b. CertainTeed Corporation.
 - c. Custom Building Products.
 - d. FinPan, Inc.
 - e. James Hardie Building Products, Inc.
 - f. National Gypsum Company.
 - g. USG Corporation.
 2. Thickness: 5/8 inch.
 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.

- c. Expansion (control) joint.
 - d. Base-of-Wall Galvanized Moisture Barrier Trim: Galvanized-steel sheet, 2 inches high.
 - 1) Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a) VersaDry, LLC.
- B. Specialty reveal Base:
- 1. Basis-of-Design Product: Fry Reglet; 4" Millwork Reveal base (MWRB).
 - a. Depth: 1-inch.
 - b. Material: extruded aluminum.
 - c. Architect to select from one of the following colors options in review with the adjacent Felt Wall Covering:
 - 1) Buffed Satin Dark Bronze.
 - 2) Buffed Satin Medium Bronze.
 - 3) Buffed Satin Light Bronze.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
- 1. Interior Gypsum Board: Paper.
 - 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
- 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose 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. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 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.
- C. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- D. Acoustical Sealant: As specified in Section 07 92 19 "Acoustical Joint Sealants."
- E. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
1. Type X: Vertical surfaces unless otherwise indicated.
 2. Ceiling Type: Ceiling surfaces.
 3. Impact-Resistant Type: As indicated on Drawings.
 4. Mold-Resistant Type: As indicated on Drawings.
- B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) or horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base

layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 INSTALLATION OF TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at showers and where indicated.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLATION OF 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 at locations indicated on Drawings and according to ASTM C840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners unless otherwise indicated.
 2. LC-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile.
 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

4. Level 5: Where indicated on Drawings.
 - a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 30 13

CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceramic mosaic tile.
2. Porcelain tile.
3. Glazed wall tile.
4. Waterproof membrane for thinset applications.
5. Waterproof / Crack isolation membrane.
6. Metal edge strips.

B. Related Requirements:

1. Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Section 09 29 00 "Gypsum Board" for cementitious backer units.

1.2 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. ISO 13007 Standards for Ceramic Tile Grouts and Adhesives.

D. Module Size: Actual tile size plus joint width indicated.

E. Face Size: Actual tile size, excluding spacer lugs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product.
- D. Product Test Reports: For tile-setting and -grouting products.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer having a minimum of 5 years of experience on projects of comparable size and scope who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- 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. Build mockup of each type of floor tile installation.
 - 2. Build mockup of each type of wall tile installation.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Dynamic Coefficient of Friction: For tiles installed on walkway surfaces, provide products with the followings values as determined by testing identical products per ANSI 137.1:
 - 1. Level Surfaces: Minimum ≥ 0.42

2.2 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
 - 2. Obtain waterproofing / crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

2.3 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.4 TILE PRODUCTS

- A. Basis of Design Products: Refer to Interior Finish Legend on Drawings.
- B. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
 - 1. Provide as indicated in Interior Finish Legend, unless otherwise indicated.
- C. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
 - 1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
 - 2. Shapes: As follows, selected from manufacturer's standard shapes:
 - a. Base for Thin-Set Mortar Installations: Straight.
 - b. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose.
 - c. External Corners for Thin-Set Mortar Installations: Surface bullnose.
 - d. Internal Corners: Field-buttet square corners, except with coved base and cap angle pieces designed to member with stretcher shapes.

2.5 THRESHOLDS AND EDGE PROTECTION

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
 - 2. Basis of Design Products: Refer to Interior Finish Legend on Drawings.

2.6 WATERPROOF MEMBRANE FOR SHOWER FLOORS ONLY

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ardex Engineered Cements; 8+9 waterproofing/crack isolation compound.
 - b. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
 - c. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane with Waterproofing/Anti Fracture Fabric.
 - d. MAPEI Corporation; Mapelastic 315 with MAPEI Fiberglass Mesh.
 - e. TEC; H.B. Fuller Construction Products Inc.; Triple Flex with Waterproofing Mesh

2.7 WATERPROOFING / CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and ANSI A118.12 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Laticrete International, Inc.; Laticrete Hydroban.
 - b. MAPEI Corporation; Mapelastic AquaDefense.
 - c. TEC; H.B. Fuller Construction Products Inc.; Hydra Flex Waterproofing Membrane.

2.8 SETTING MATERIALS

- A. Modified Dry-Set Cement Mortar (Thinset): ANSI A118.4 and ISO 13007; C2.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Wall Applications, non-large format tile:
 - 1) Ardex Engineered Cements, "X5".
 - 2) Custom Building Products, "MegaLite Rapid Set Crack Prevention Mortar."
 - 3) Laticrete International, Inc., "253 Gold."
 - 4) MAPEI Corporation, "Ultraflex 2."
 2. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4 and ISO 13007; C2T.
- B. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3 and ISO 13007; R2.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Custom Building Products, "EMB Lite".
 - b. Laticrete International, Inc., "Latapoxy 300."
 - c. MAPEI Corporation, "Kerapoxy 410".
2. Adhesives shall have a VOC content of 65 g/L or less.
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

2.9 GROUT MATERIALS (Reference "Tile Installation Schedule" at end of Section)

- A. Standard Cement Grout (Sanded or Unsanded as Scheduled): ANSI A118.6 and ISO 13007; CG2WA.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ardex Engineered Cements, "FH / FG-C grout".
 - b. Custom Building Products, "PolyBlend Grout."
 - c. Laticrete International, Inc., "1500" / "1600".
 - d. MAPEI Corporation, "Keracolor S or U."
 - e. TEC; H.B. Fuller Construction Products Inc. "Accucolor Sanded or Unsanded Grout".
- B. High-Performance Tile Grout: ANSI A118.7.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ardex Engineered Cements, "FL grout".
 - b. Custom Building Products, "Prism SureColor Grout."
 - c. Laticrete International, Inc., "Permacolor Select" Grout.
 - d. MAPEI Corporation, "Ultracolor Plus" Grout
 - e. TEC; H.B. Fuller Construction Products Inc. "Accucolor XT".
 2. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
- C. Water-Cleanable Epoxy Grout: ANSI A118.3 and ISO 13007; RG, with a VOC content of 65 g/L or less.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ardex Engineered Cements, "WA 100% solids epoxy grout".
 - b. Custom Building Products, "100% Solids Epoxy Grout" or "Fusion".
 - c. Laticrete International, Inc., "SpectraLOCK Pro Premium Grout."
 - d. MAPEI Corporation, "Kerapoxy CQ" or "Flexcolor CQ".
 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

2.10 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ardex Engineered Cements, Feather Finish or K15.
 - b. Laticrete, "L&M Duracrete" or "L&M Durapatch Industrial"
 - c. MAPEI, "Mapecem Quickpatch."
- B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; nickel silver or stainless-steel, ASTM A 666, 300 Series exposed-edge material.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Blanke Corporation.
 - b. Ceramic Tool Company, Inc.
 - c. Schluter Systems L.P.
 2. Basis of Design Manufacturer: Schluter Systems.
 - a. Profiles:
 - 1) Outside Corner Edge Protection, Tile-to-Tile: QUADDEC.
 - 2) Outside Corner Edge Protection, Tile-to-Gypsum Board: SCHIENE.
 - 3) Finishing Edge Protection, Tile-to-Gypsum Board: SCHIENE.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
1. Basis of Design Products, Laticrete, "Stonetech Professional Stone & Tile Cleaner".
- D. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Building Products; Aqua Mix; Sealer's Choice Gold.
 - b. Laticrete; StoneTech Professional Advanced Grout Sealer.
 - c. MAPEI Corporation, "Ultracare Penetrating Tile, Stone & Grout Sealer".
 - d. Miracle Sealants Company; 511 H2O Plus Grout Sealer.
 - e. Merkrete, a Parex USA Inc. company, "GroutSealer".
 2. Sealers testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.11 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 07 92 00 "Joint Sealants."
 - 1. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.
 - 2. Colors: Provide colors of exposed sealants to match colors of grout in tile.

2.12 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable or self-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, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 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 consisting of tiles 8 by 8 inches or larger.
 - b. Tile floors consisting of rib-backed tiles.
 - 2. Follow procedures in the ANSI A108 Series of tile installation standards for tile layout including but not limited to:
 - a. Center and balance areas.
 - b. Excess amount of cuts.
 - c. Smooth edge cuts.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Wall tile joint maximum 1/8 inch
 - 2. Floor tile joint maximum 3/16 inch
 - 3. Align joints center to center.
- H. At inside corners of tile floors, base and walls, provide sealant joint. Joint width to match specified joint widths. Color of exposed sealant to match color of grout in tile.
- I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- J. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- K. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
 - 1. Install metal edge strips in lengths as long as practical without gaps at seams. Do not use multiple strips where one continuous strip can be installed.
- L. Grout Sealer: Apply floor sealer to grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

- B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.5 WATERPROOFING / CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install waterproofing / crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproofing / crack isolation membrane to cure before installing tile or setting materials over it.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Ceramic Tile Installation F113: TCNA F113; thinset mortar.

- a. Ceramic Tile Type: Refer to Interior Finish Legend on Drawings.
 - b. Thinset Mortar: Modified dry-set mortar.
 - 1) Load-Bearing Performance: Moderate.
 - c. Grout: High-performance sanded grout.
 - d. Locations: Non-wet floors, unless noted otherwise.
2. Ceramic Tile Installation F115: TCNA F115; thinset mortar; epoxy grout.
 - a. Ceramic Tile Type: Refer to Interior Finish Legend on Drawings.
 - b. Thinset Mortar: Modified dry-set mortar.
 - 1) Load-Bearing Performance: Moderate.
 - c. Grout: Water-cleanable epoxy grout.
 - d. Locations: Lobby floors, unless noted otherwise.
 3. Ceramic Tile Installation F122: TCNA F122; thinset mortar on waterproof membrane.
 - a. Ceramic Tile Type: Refer to Interior Finish Legend on Drawings.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: Water-cleanable epoxy grout.
 - d. Locations: Bathrooms or Public Restrooms.
 4. Ceramic Tile Installation F125: TCNA F125-Full; thinset mortar on waterproof / crack isolation membrane.
 - a. Ceramic Tile Type: Refer to Interior Finish Legend on Drawings.
 - b. Thinset Mortar: Medium-bed, modified dry-set mortar.
 - c. Grout: Water-cleanable epoxy grout.
 - d. Locations: Floor tile over 14 by 14 inches (355 by 355 mm) in size or if one side is over 18-inches (457 mm) long.
- B. Interior Wall Installations, Metal Studs or Furring:
1. Ceramic Tile Installation W243: TCNA W243; thinset mortar on gypsum board.
 - a. Ceramic Tile Type: Refer to Interior Finish Legend on Drawings.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: High-performance unsanded grout.
 - d. Locations: Where indicated on Drawings.
 2. Ceramic Tile Installation W243: TCNA W243; thinset mortar on gypsum board.
 - a. Ceramic Tile Type: Refer to Interior Finish Legend on Drawings.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: High-performance unsanded grout.
 - d. Locations: Wall tile over 14 by 14 inches (355 by 355 mm) in size or if one side is over 18-inches (457 mm) long.
 3. Ceramic Tile Installation W244C: TCNA W244C; thinset mortar on cementitious backer units over waterproof / crack isolation membrane.
 - a. Ceramic Tile Type: Refer to Interior Finish Legend on Drawings.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: Water-cleanable epoxy grout.
 - d. Locations: Shower walls.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.
- B. Related Requirements:
 - 1. Section 07 92 19 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Ceiling suspension-system members.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
 - 4. Size and location of initial access modules for acoustical panels.
 - 5. Items penetrating finished ceiling and ceiling-mounted items including the following:
 - a. Lighting fixtures.
 - b. Diffusers.
 - c. Grilles.
 - d. Speakers.
 - e. Sprinklers.
 - f. Access panels.
 - g. Perimeter moldings.
 - 6. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
 - 7. Minimum Drawing Scale: 1/8 inch = 1 foot.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Build mockup of typical ceiling area as shown on Drawings.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Verify ceiling products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class A according to ASTM E1264.
 - 2. Smoke-Developed Index: 50 or less.
- 2.3 ACT, ACOUSTICAL PANELS
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CertainTeed Corporation; Saint-Gobain North America.
 - 2. Rockfon (Rockwool International).
 - 3. USG Corporation.
 - B. Basis of Design Products: Subject to compliance with requirements of specifications, provide the products indicated for each designation in the Interior Finish Legend.
- 2.4 METAL SUSPENSION SYSTEM
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong Ceiling & Wall Solutions.
 - 2. CertainTeed Corporation; Saint-Gobain North America.
 - 3. Rockfon (Rockwool International).
 - 4. USG Corporation.
 - B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification, and finish indicated.
 - C. Standard Exposed Tee Ceiling Systems:
 - 1. Narrow-Face (9/16-inch), Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 9/16-inch-wide metal caps on flanges.
 - a. Structural Classification: Intermediate-duty system, or greater as otherwise required to comply with seismic regulations.
 - b. End Condition of Cross Runners: Override (stepped) or butt-edge type.
 - c. Face Design: Flat, flush.
- 2.5 ACCESSORIES
- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain,

without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.

- a. Type: Postinstalled expansion or Postinstalled bonded anchors.
- b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B633, Class SC 1 (mild) service condition.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch-diameter wire.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong World Industries, Inc.
2. CertainTeed Corporation; Saint-Gobain North America.
3. Fry Reglet Corporation.
4. Gordon, Inc.
5. Rockfon (Rockwool International).
6. USG Corporation.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.

1. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C635/C635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.7 ACOUSTICAL SEALANT

- A. Acoustical Sealant: As specified in Section 07 92 19 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C636/C636M and manufacturer's written instructions.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to postinstalled mechanical or adhesive anchors that extend through forms into concrete.
 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 7. Do not attach hangers to steel deck tabs.
 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
 11. When extending existing acoustical ceiling within a room, match existing grid pattern. Discontinuous grid patterns are prohibited.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 2. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
- G. Where existing ceilings are present:
1. Rework existing ceiling grid as required to maintain a continuous pattern within each room. Group new and existing tiles into areas for consistency, matching color and texture.

2. Replace damaged, cracked, stained, or missing ceiling tiles throughout the areas of project as needed with tiles to match existing pattern and color.
3. Reseat insulation above existing ceiling tile where disturbed. Leave insulation in continuous plane, tightly butted throughout. Do not cover light fixtures.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 51 33

ACOUSTICAL METAL PAN CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical metal pans and associated suspension system for interior ceilings.

B. Related Requirements:

1. Section 07 92 19 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.
2. Section 09 51 13 "Acoustical Panel Ceilings" for ceilings consisting of mineral-base and glass-fiber-base acoustical panels and exposed suspension systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, include procedure for cutting metal pans.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepare Samples of size indicated below:

1. Metal Pans: Set of 6-inch- square Samples of each type, finish, color, pattern, and texture. Show pan edge profile.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.
3. Sound Absorber: Sample of each type matching size of Sample metal pan.

C. Delegated Design Submittals: For design of attachment devices.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other sections.
4. Size and location of access modules for acoustical panels.
5. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets. Grilles, Diffusers.
 - c. Speakers.

- d. Sprinklers.
 - e. Access panels.
 - 6. Perimeter moldings.
 - 7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
 - B. Qualification Data: For testing agency.
 - C. Product Test Reports: For each acoustical metal pan ceiling, for tests performed by a qualified testing agency.
 - D. Evaluation Reports: For each acoustical metal pan ceiling suspension system and anchor and fastener type.
 - E. Field quality-control reports.
- 1.4 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For finishes to include in maintenance manuals.
- 1.5 QUALITY ASSURANCE
- A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.
 - B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical ceiling area as indicated on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver acoustical metal pans, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
 - B. Handle acoustical metal pans, suspension-system components, and accessories carefully to avoid damaging units and finishes in any way.

PART 2 - PRODUCTS

- 2.1 PERFORMANCE REQUIREMENTS
- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design attachment devices.
 - B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

2.2 MPC, ALUMINUM PANS FOR ACOUSTICAL METAL PAN CEILING

- A. Basis-of-Design Product: Provide product indicated on Finish Legend.
1. Sound-Absorbent Fabric Layer: Provide fabric layer, sized to fit concealed surface of pan, and consisting of black, nonwoven, nonflammable, sound-absorbent material with surface-burning characteristics for flame-spread index of 25 or less and smoke-developed index of 50 or less, as determined by testing according to ASTM E84.
 - a. Bond fabric layer to panels in the factory with manufacturer's standard nonflammable adhesive.
 - b. Basis-of-Design Product: Lindner-Group; Acustica CA Acoustic Fabric Inlay.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C635/C635M requirements.
- B. Suspension Systems: Provide systems complete with carriers, runners, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, and other suspension components required to support ceiling units and other ceiling-supported construction.
- C. Attachment Devices: Size for 5 times the design load indicated in ASTM C635/C635M, Table 1, Direct Hung, unless otherwise indicated. Comply with seismic design requirements.
- D. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.
- E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so its stress at 3 times the hanger design load indicated in ASTM C635/C635M, Table 1, Direct Hung, is less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.
- F. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- G. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- H. Exposed Metal Edge Moldings and Trim: Provide exposed members as indicated or as required to comply with seismic requirements of authorities having jurisdiction, to conceal edges of and penetrations through ceiling, to conceal edges of pans and

runners, for fixture trim and adapters, for fasciae at changes in ceiling height, and for other conditions; of metal and finish matching acoustical metal pan ceiling units unless otherwise indicated.

1. For Circular Penetrations of Ceiling: Fabricate edge moldings to diameter required to fit penetration exactly.

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL, STANDARD-GRID METAL PAN CEILING

- A. Basis-of-Design Product: provide product indicated on Drawings
- B. Suspension System: For lay-in and torsion-spring-hinged pans.
 1. with factory-cut slots fabricated to accept torsion-spring-hinged attachment.

2.5 ACOUSTICAL SEALANT

- A. Acoustical Sealant for Exposed and Concealed Joints:
 1. As specified in Section 07 92 19 "Acoustical Joint Sealants."

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 METALLIC-COATED STEEL SHEET FINISHES

- A. Color-Coated Finish: Manufacturer's standard powder-coat baked paint complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical metal pan ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical metal pan ceilings.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical metal pans to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width pans at borders, and comply with layout shown on reflected ceiling plans and coordination drawings.

3.3 INSTALLATION

- A. General: Install acoustical metal pan ceiling assemblies to comply with ASTM C636/C636M and manufacturer's written instructions.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling suspension members or carrying channels and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that do not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 7. Do not attach hangers to steel deck tabs.
 - 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical metal pans.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Cut acoustical metal pan units for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet. Cut and treat edges to comply with manufacturer's written instructions.
- F. Install acoustical metal pans in coordination with suspension system and exposed moldings and trim. Comply with manufacturer's installation tolerances.
1. For lay-in, reveal-edge pans on suspension-system runners, install pans as shown on Drawings.
 2. For torsion-spring-hinged pans, position pans according to manufacturer's written instructions.
 3. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.
 4. Fit adjoining units to form flush, tight joints.
 5. Install directionally patterned or textured metal pans in directions indicated.
 6. Install sound-absorbent pads in perforated metal pans over metal spacer grids.
- G. Install sound attenuation panels in areas indicated by reflected ceiling plans or room finish schedules. Lay panels directly on ceiling system and close major openings to form complete coverage in required areas. Lay second sound-absorbent pads on sound attenuation panels.
- 3.4 CLEANING
- A. Clean exposed surfaces of acoustical metal pan ceilings, including trim and edge moldings, after removing strippable, temporary protective covering, if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient wall base.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.3 CLOSEOUT SUBMITTALS

- A. Record Documents: Showing locations of substrate moisture and alkalinity tests. Provide markups on floor plan indicating the location of each test and the dates tests were performed.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Verify products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 RESILIENT WALL BASE

- A. Rubber Wall Base, as scheduled in Interior Finish Schedule: ASTM F 1861,
 - 1. Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous), or Type TP (rubber, thermoplastic) Group I (solid, homogeneous).
 - a. Style and Location:
 - 1) Style A, Straight: Provide in areas with carpet.
 - 2) Style B, Cove: Provide in areas with resilient flooring.
- B. Minimum Thickness: 0.125 inches or as indicated in Interior Finish Schedule on Drawings.
- C. Height: As indicated in Interior Finish Schedule on Drawings.
- D. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length dependent on product scheduled.
- E. Colors: As indicated in Interior Finish Schedule on Drawings.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
 - 1. Verify adhesives have a VOC content of 50 g/L or less and 60 g/L or less for rubber stair treads.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Do not install resilient products until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- C. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

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 practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from surfaces.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 09 65 19
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid vinyl floor tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of resilient floor tile.

1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

C. Samples: Full-size units of each color, texture, and pattern of floor tile required.

D. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 LVT, SOLID VINYL FLOOR TILE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Interior Finish Schedule or comparable product approved by the Architect.
- B. Tile Standard: ASTM F 1700.
 - 1. Class: As indicated by product designations.
- C. Colors and Patterns: As indicated by finish schedule.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft.in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor tile until Substantial Completion.

END OF SECTION

SECTION 09 66 23

RESINOUS MATRIX TERRAZZO FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thin-set, epoxy-resin terrazzo flooring.

B. Related Requirements:

1. Section 07 92 00 "Joint Sealants" for sealants installed with terrazzo.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to terrazzo including, but not limited to, the following:
 - a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Review special terrazzo designs and patterns.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include terrazzo installation requirements. Include plans, sections, component details, and relationship to other work. Show layout of the following:

1. Divider strips.
2. Control-joint strips.
3. Accessory strips.
4. Terrazzo patterns.

C. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For each type of terrazzo material or product.

C. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

- D. Test Reports: Pre-installation substrate moisture and alkalinity tests.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For terrazzo to include in maintenance manuals.
- B. Record Documents: Showing locations of substrate moisture and alkalinity tests. Provide markups on floor plan indicating the location of each test and the dates tests were performed.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Engage an installer who a contractor member of NTMA or is certified in writing by terrazzo manufacturer as qualified to install manufacturer's products.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockups for terrazzo including accessories.
 - a. Size: Minimum 100 sq. ft. (9 sq.m) of typical poured-in-place flooring and base condition for each color and pattern in locations directed by Architect
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.
- B. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.
- C. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- D. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- E. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain primary terrazzo materials from single source from single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
- B. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

- A. NTMA Standards: Comply with NTMA's written recommendations for terrazzo type indicated unless more stringent requirements are specified.

2.3 EPOXY-RESIN TERRAZZO

- A. Epoxy-Resin Terrazzo: Comply with manufacturer's written instructions for matrix and aggregate proportions and mixing.
 - 1. Basis-of-Design Product: Provide product indicated on Finish Schedule on Drawings or comparable product indicated below:
 - a. American Terrazzo.
 - b. Crossfield Products Corp., Dex-O-Tex Division.
 - c. General Polymers Corporation.
 - d. Hi-Tek Polymers, Inc.
 - e. Key Resin Company.
 - f. Terrazzo Marble and Supply.
 - 2. Thickness: 3/8-inch (9.5 mm) nominal.
 - 3. Formulated Mix Color and Pattern: As selected by Architect from full range of industry colors.
- B. Materials:
 - 1. Flexible Reinforcing Membrane: Manufacturer's resinous membrane for substrate-crack preparation and reflective-crack reduction.
 - a. Reinforcement: Fiberglass scrim.
 - 2. Primer: Manufacturer's product recommended for substrate and use indicated.
 - 3. Epoxy-Resin Matrix: Manufacturer's standard recommended for use indicated and in color required for mix indicated.
 - a. Physical Properties without Aggregates:
 - 1) Hardness: 60 to 85 per ASTM D2240, Shore D.
 - 2) Minimum Tensile Strength: 3000 psi (20.7 MPa) per ASTM D638 for a 2-inch (51-mm) specimen made using a "C" die per ASTM D412.
 - 3) Minimum Compressive Strength: 10,000 psi (6.9 MPa) per ASTM D695, Specimen B cylinder.

- 4) Chemical Resistance: No deleterious effects by contaminants listed below after seven-day immersion at room temperature per ASTM D1308.
 - a) Distilled water.
 - b) Mineral water.
 - c) Isopropanol.
 - d) Ethanol.
 - e) 0.025 percent detergent solution.
 - f) 1.0 percent soap solution.
 - g) 5 percent acetic acid.
 - h) 10 percent sodium hydroxide.
 - i) 10 percent hydrochloric acid.
 - j) 30 percent sulfuric acid.
 - b. Physical Properties with Aggregates: For terrazzo blended according to manufacturer's recommendations with one part epoxy resin with three parts marble aggregate consisting of 60 percent No. 1 chips and 40 percent No. 0 chips that is ground and grouted to a 1/4-inch (6.35-mm) nominal thickness, and cured for 7 days at 75 deg F (24 deg C) plus or minus 2 deg F (1 deg C) and at 50 percent plus or minus 2 percent relative humidity.
 - 1) Flammability: Self-extinguishing, maximum extent of burning 1/4 inch (6.35 mm) according to ASTM D635.
 - 2) Thermal Coefficient of Linear Expansion: 0.0025 inch/inch per deg F (0.0025 mm/mm per 0.5556 deg C) according to ASTM C531.
4. Aggregates: Comply with NTMA gradation standards for mix indicated and contain no deleterious or foreign matter.
 - a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C131/C131M.
 - b. 24-Hour Absorption Rate: Less than 0.75 percent.
 - c. Dust Content: Less than 1.0 percent by weight.
 5. Finishing Grout: Resin based.

2.4 STRIP MATERIALS

- A. Thin-Set Divider Strips: L-type angle in depth required for topping thickness indicated.
 1. Material: As indicated.
 2. Top Width: As indicated.
- B. Control-Joint Strips: Separate, double L-type angles, positioned back to back, that match material and color of divider strips and in depth required for topping thickness indicated.
- C. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
 1. Base-bead strips for exposed top edge of terrazzo base.
 2. Edge-bead strips for exposed edges of terrazzo.

2.5 MISCELLANEOUS ACCESSORIES

- A. Strip Adhesive: Epoxy-resin adhesive recommended by adhesive manufacturer for this use.
 - 1. Verify adhesives have a VOC content of 70 g/L or less.
- B. Anchoring Devices:
 - 1. Strips: Provide mechanical anchoring devices or adhesives for strip materials as recommended by manufacturer and 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.
 - 1. Basis of Design Product: Terroxy Fill.
- D. Joint Compound: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- E. Resinous Matrix Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.
- F. Sealer: Slip- and stain-resistant, penetrating-type sealer that is chemically neutral; does not affect terrazzo color or physical properties; and is recommended by sealer manufacturer.
 - 1. Surface Friction: Not less than 0.6 according to ASTM D2047.
 - 2. Acid-Base Properties: With pH factor between 7 and 10.
- G. Floor Surface Protector: High performance floor surface protector.
 - 1. Basis of Design Product: 3M Stonegard Floor Protector.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of flooring.
- B. Concrete Substrates: Prepare according to ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
 3. Alkalinity Testing: Perform pH testing according to ASTM F710. Proceed with installation only if pH readings are not less than 7.0 and not greater than 8.5.
 4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 5. 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.
 6. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written instructions.
 7. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.
- C. Proceed with terrazzo installation only after concrete substrates pass moisture testing or after installation of moisture-vapor-emission-control membrane on substrate areas that fail testing.

3.3 EPOXY-RESIN TERRAZZO INSTALLATION

- A. Comply with NTMA's written recommendations for terrazzo and accessory installation.
- B. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions and NTMA's "Terrazzo Specifications and Design Guide."
- C. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet (6.4 mm in 3 m); noncumulative.
- D. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
- E. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.
- F. 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.

- G. Primer: Apply to terrazzo substrates according to manufacturer's written instructions.
 - H. Strip Materials:
 - 1. Divider and Control-Joint Strips:
 - a. Locate divider strips in locations indicated.
 - b. Install control-joint strips back to back and directly above concrete-slab control joints unless noted otherwise.
 - c. Install control-joint strips with 1/4-inch (6.4-mm) gap between strips, and install sealant in gap.
 - d. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
 - 2. Accessory Strips: Install as required to provide a complete installation.
 - I. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions.
 - 1. Installed Thickness: 3/8 inch (9.5 mm) nominal.
 - 2. Terrazzo Finishing: Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
 - a. Rough Grinding: Grind with 24-grit or finer stones or with comparable diamond abrasives. Follow initial grind with 60/80-grit stones or with comparable diamond abrasives.
 - b. Grouting: Before grouting, clean terrazzo with water, rinse, and allow to dry. Apply and cure epoxy grout.
 - c. Fine Grinding/Polishing: Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted. Grind with 80-grit stones or with comparable diamond abrasives until grout is removed from surface.
 - 3. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet (6.4 mm in 3 m); noncumulative.
 - J. Install and finish poured-in-place terrazzo stairs at the same time the adjacent terrazzo flooring is installed.
 - K. Install and finish poured-in-place terrazzo base at the same time the adjacent terrazzo flooring is installed.
- 3.4 REPAIR
- A. Cut out and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.
- 3.5 CLEANING AND PROTECTION
- A. Cleaning:
 - 1. Remove grinding dust from installation and adjacent areas.

2. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow them to dry thoroughly.
- B. Sealing:
1. Seal surfaces according to NTMA's written recommendations.
 2. Apply sealer according to sealer manufacturer's written instructions.
- C. Floor Protector:
1. Apply floor protector according to sealer manufacturer's written instructions at Substantial Completion.
- D. 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 68 13

TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modular carpet tile.

B. Related Requirements:

1. Section 09 65 13 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, plans showing the following:

1. Type of subfloor.
2. Type of installation.
3. Pattern of installation.
4. Pattern type, location, and direction.
5. Type, color, and location of edge, transition, and other accessory strips.
6. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

- C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with the Carpet and Rug Institute's CRI 104.

1.7 FIELD CONDITIONS

- A. Comply with the Carpet and Rug Institute's CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.8 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.

- f. Delamination.
- 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CPT, CARPET TILE

- A. Basis-of-Design Product: Provide product indicated on Drawings.
- B. Color and Pattern: As indicated.
- C. Size: As indicated.
- D. Applied Treatments:
 - 1. Soil-Resistance Treatment: Manufacturer's standard treatment.
 - 2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
 - a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.
- E. Sustainable Design Requirements:
 - 1. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Performance Characteristics:
 - 1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
 - 2. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

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 comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.
 - 1. Adhesives shall have a VOC content of 50 g/L or less.
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with the Carpet and Rug Institute's CRI 104, Section 13.7.
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 09 72 00

WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Textile wall covering.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
- B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement, seams, and termination points.
- C. Samples for Verification: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36-inch-long in size.
 - 1. Wall-Covering Sample: From same production run to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.
- D. Product Schedule: For wall coverings. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for installation.
 - 1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.
- B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 2. Fire-Growth Contribution: No flashover and heat and smoke release according to NFPA 286.

2.2 MANUFACTURERS

- A. Basis of Design Products: Refer to Interior Finish Legend on Drawings.
- B. Colors, Textures, and Patterns: Refer to Interior Finish Legend on Drawings.

2.3 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.
 1. Adhesives shall have a VOC content of 50 g/L or less.
- B. Primer/Sealer: Mildew resistant, complying with requirements in Section 09 91 23 "Interior Painting" and recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.

- C. Wall Liner: Nonwoven, synthetic underlayment and adhesive as recommended in writing by wall-covering manufacturer.
 - 1. Adhesives shall have a VOC content of 50 g/L or less.
- D. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - 2. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 3. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.
- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 WALL LINER INSTALLATION

- A. Install wall liner, without gaps or overlaps. Form smooth wrinkle-free surface for finished installation. Do not begin wall-covering installation until wall liner has dried.

3.4 WALL-COVERING INSTALLATION

- A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.
- B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.

- C. Install strips in same order as cut from roll.
- D. Install wall covering without lifted or curling edges and without visible shrinkage.
- E. Match pattern 72 inches above the finish floor.
- F. Install seams vertical and plumb at least 6 inches from outside corners and 3 inches from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.
- G. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.
- H. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.5 CLEANING

- A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION

SECTION 09 72 20
FELT WALL COVERING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following:
 - 1. Felt wall covering.
- B. Related Requirements:
 - 1. Section 09 72 00 "Wall Covering" for vinyl and textile wall covering materials.

1.2 SEQUENCING

- A. Schedule and coordinate work of adjacent trades to ensure that wall base installation occurs after wall coverings are installed, to avoid gaps or open seams that may occur when bottom edge of wall covering abuts top edge of base.

1.3 ACTION SUBMITTALS

- A. Product Data for each type of product specified.
 - 1. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
- B. Samples for verification in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
 - 1. Wall Covering Material: Full-width sample, not less than 36 inches long, from dye lot used for the Work.
 - a. Submit sample with specified treatments applied.
 - b. Mark top and face of material.
 - c. Show complete pattern repeat.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wall covering to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed 5 projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

- B. Mockups: Prior to installing wall covering, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution.
 - 1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect 7 days in advance of the 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 start of final unit of Work.
 - 5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install wall covering until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.
- B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by the wall covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Panels shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - 2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.

2.2 FELT WALL COVERING

- A. Basis of Design Products: Autex Acoustics; Cube.

- B. Colors, Textures, and Patterns: Refer to Interior Finish Legend on Drawings.

2.3 MATERIALS

- A. Felt Wall Covering.
 - 1. Material: 100% polyester fiber (PET)
 - 2. Panel Thickness: ½-inch and 1-inch.
 - 3. NRC Rating: 0.45-0.80 (per thickness of panel).
 - 4. Tile Pattern: As indicated in Interior Finish Legend on Drawings.
 - 5. Flammability: ASTM E 84 Class A (unadhered).
 - 6. Microbial Resistance, ASTM G21: no growth.

2.4 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall covering manufacturer.
 - 1. Adhesives shall have a VOC content of 50 g/L or less.
- B. Primer/Sealer: Mildew resistant, and recommended in writing by primer/sealer and wall covering manufacturers for intended substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair wall covering's bond, including mold, mildew, oil, grease, incompatible primers, and dirt.
- C. Prepare substrates to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Painted Surfaces: Treat areas susceptible to pigment bleeding.
 - 2. Prime new gypsum board with primer recommended by wall covering manufacturer.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finishes with fine sandpaper.

- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- F. Acclimatize wall covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION, GENERAL

- A. General: Comply with wall coverings manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Install wall covering with no gaps or overlaps.
- C. Install seams vertical and plumb at least 6 inches from outside corners and 3 inches from inside corners. No horizontal seams.
- D. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.
- E. Trim edges for color uniformity, pattern match, and tight closure at seams and edges. Butt seams.

3.4 CLEANING

- A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended by wall covering manufacturer.
- C. Replace wall covering that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION

SECTION 09 78 11

INTERIOR FABRICATED WOOD WALL PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid Wood wall panels with notched backers.

B. Related Sections:

1. Section 06 10 53 "Miscellaneous Carpentry" for furring, blocking, and other carpentry work not exposed to view.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, closures, and accessories; and special details.
2. Accessories: Include details of the trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:

1. Wood Panels: 12 inches long by actual panel width. Include fasteners, closures, and other accessories.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For panels to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical panel assembly, including corner, supports, attachments, and accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, panels, and other manufactured items so as not to be damaged or deformed. Package panels for protection during transportation and handling.
- B. Unload, store, and erect panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store panels to ensure dryness, with positive slope for drainage of water. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates in accordance with test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.

2.2 WP-01, SOLID WOOD WALL PANELS

- A. Description: Wood slatted wall panels with notched alignment backers.
- B. Basis-of-Design Product: Armstrong Ceiling and Wall Solutions; WOODWORKS Grille. Refer to Finish Schedule for complete product description.
 - 1. Color: as selected by Architect.
- C. Panel Configuration and Height: Refer to Finish Schedule.
- D. Orientation: as indicated on Drawings.

- E. Mounting Method: wall mounted with concealed screws or with furring strips. Refer to drawings for specific mounting conditions.
- F. Surface Finish: clear, semi-gloss tinted topcoat.

2.3 MISCELLANEOUS MATERIALS

- A. Trim: Provide trim formed from same material as panels as required to provide finished appearance. Locations include, but are not limited to, bases, sills, jambs, corners, framed openings and fillers. Finish and trim with same finish system as adjacent panels.

2.4 FABRICATION

- A. Fabricate and finish 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, supports, and other conditions affecting performance of the Work.
 - 1. Examine wall substrate to verify that supported by framing or blocking and that installation is within flatness tolerances required by wall panel manufacturer.
- B. Examine roughing-in for components and systems penetrating panels to verify actual locations of penetrations relative to seam locations of panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated.
 - 1. Shim or otherwise plumb substrates receiving panels.
 - 2. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 3. Install trim as panel work proceeds.
 - 4. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 - 5. Align bottoms of panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten trim around openings and similar elements with self-tapping screws.

- B. Trim: Comply with performance requirements, manufacturer's written installation instructions
 - 1. Install exposed trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal trim to fit.

3.3 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer. Maintain in a clean condition during construction.
- B. Replace panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 09 81 13
ACOUSTIC BOARD INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Acoustical fiber board insulation.
- B. Related Sections include the following:
 - 1. Division 07 Section "Thermal Insulation" for board, blanket, and batt insulation types.

1.2 ACTION SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of board insulation through one source.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CertainTeed Corporation.
 - 2. Johns Manville Corporation.
 - 3. Knauf Insulation
 - 4. Thermafiber.

2.2 AP-01, ACOUSTICAL MATERIALS

- A. Black Acoustical Insulation: Dyed black, glass fiber insulation with fully-bonded abuse resistant non-woven black facing.
 - 1. Thickness: 2-inches.

2. Surface Burning Characteristics: Maximum flame spread of 25, maximum smoke developed of 50, when tested in accordance with ASTM E 84.
 3. Water Vapor Sorption: Less than 3 percent by weight when tested in accordance with ASTM C 1104.
- B. Basis of Design Product: CertainTeed; CertaPro AcoustaBoard Black with ToughGard Facing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 and snow.

3.3 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

- 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.

3.4 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 09 91 23

INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Concrete masonry units (CMUs).
 - 3. Steel and iron.
 - 4. Gypsum board.
- B. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing" for shop priming structural steel.
 - 2. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.
 - 3. Section 09 96 00 "High-Performance Coatings" for tile-like coatings.

1.2 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.

- C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 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.

1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Behr Process Corporation.
 2. Benjamin Moore & Co.
 3. Coronado Paint; Benjamin Moore Company.
 4. Dulux (formerly ICI Paints); a brand of AkzoNobel.
 5. Duron, Inc.
 6. Glidden Professional.
 7. Kelly-Moore Paint Company Inc.
 8. PPG Architectural Coatings.
 9. Pratt & Lambert.
 10. Rust-Oleum Corporation; a subsidiary of RPM International, Inc.
 11. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 50 g/L.
 3. Dry-Fog Coatings: 150 g/L.
 4. Primers, Sealers, and Undercoaters: 100 g/L.
 5. Rust-Preventive Coatings: 100 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
 7. Pretreatment Wash Primers: 420 g/L.
 8. Shellacs, Clear: 730 g/L.

9. Shellacs, Pigmented: 550 g/L.

- D. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Colors: As indicated in a color schedule.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (CMUs): 12 percent.
 - 3. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat,

but provide sufficient difference in shade of undercoats to distinguish each separate coat.

- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
 - 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 3), MPI #145.
- B. Concrete Substrates, Traffic Surfaces:
 - 1. Water-Based Concrete Floor Sealer System:
 - a. First Coat: Sealer, water based, for concrete floors, matching topcoat.
 - b. Topcoat: Sealer, water based, for concrete floors, MPI #99.

C. CMU Substrates:

1. Institutional Low-Odor/VOC Latex System:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 3), MPI #145.

D. Steel Substrates:

1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer, rust inhibitive, water based MPI #107.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.

E. Gypsum Board Substrates:

1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat for Ceilings Only: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1), MPI #143.
 - d. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 3), MPI #145.
 - e. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 6), MPI #146.

END OF SECTION

SECTION 09 96 00
HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of high-performance coating systems on the following substrates:
 - 1. Exterior Substrates:
 - a. Steel.
 - b. Galvanized metal.
 - 2. Interior Substrates:
 - a. Concrete, vertical surfaces.
 - b. Concrete masonry units (CMUs).
 - c. Steel.
 - d. Gypsum board.
- B. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing" for shop priming of structural steel with primers specified in this Section.
 - 2. Section 09 91 23 "Interior Painting" for general field painting.

1.2 DEFINITIONS

- A. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- B. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- C. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each coating system indicated 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 coating system.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Behr Process Corporation.
2. Benjamin Moore & Co.
3. Devoe Paint Company; Akzo Nobel.
4. Dulux (formerly ICI Paints); a brand of AkzoNobel.
5. PPG Architectural Finishes, Inc.
6. Pratt & Lambert.
7. Sherwin-Williams Company (The).
8. Tnemec Company, Inc.
9. Wolfgordon Scuffmaster.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists" and as listed in coating schedule.
- B. Material Compatibility:
 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
 3. Products shall be of same manufacturer for each coat in a coating system.
- C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 50 g/L.
 3. Primers, Sealers, and Undercoaters: 100 g/L.
 4. Rust-Preventive Coatings: 100 g/L.
 5. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
 6. Pretreatment Wash Primers: 420 g/L.
 7. Floor Coatings: 50 g/L.
 8. Shellacs, Clear: 730 g/L.
 9. Shellacs, Pigmented: 550 g/L.
- D. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Colors: As indicated in color schedule.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
 2. Masonry (Clay and CMUs): 12 percent.
 3. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because

of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
1. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi at 6 to 12 inches.
 2. Abrasive blast clean surfaces to comply with SSPC-SP 7/NACE No. 4.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.
1. Clean surfaces with pressurized water. Use pressure range of 100 to 600 psi at 6 to 12 inches.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
1. SSPC-SP 6/NACE No. 3.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
1. Use applicators and techniques suited for coating and substrate indicated.
 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 - 1. Contractor shall touch up and restore coated surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Steel Substrates:
 - 1. Pigmented Polyurethane over High-Build Epoxy System MPI EXT 5.1J:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - b. Intermediate Coat: Epoxy, high build, low gloss, MPI #108.
 - c. Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6), MPI #72.
- B. Galvanized-Metal Substrates:
 - 1. Pigmented Polyurethane over Epoxy Primer System MPI EXT 5.3L:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - b. Intermediate Coat: Polyurethane, two component, pigmented, gloss matching topcoat.

- c. Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6), MPI #72.

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Concrete Substrates, Vertical Surfaces:

1. Epoxy-Modified Latex System MPI INT 3.1G:
 - a. Prime Coat: Epoxy-modified latex, matching topcoat.
 - b. Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - c. Topcoat: Epoxy-modified latex, semi-gloss (MPI Gloss Level 5), MPI #215.

B. CMU Substrates:

1. Epoxy-Modified Latex System MPI INT 4.2J:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Epoxy-modified latex, interior, matching topcoat.
 - c. Topcoat: Epoxy-modified latex, semi-gloss (MPI Gloss Level 5), MPI #215.

C. Steel Substrates:

1. Epoxy-Modified Latex System MPI INT 5.1K:
 - a. Prime Coat: Primer, rust inhibitive, water based, MPI #107.
 - b. Intermediate Coat: Epoxy-modified latex, interior, matching topcoat.
 - c. Topcoat: Epoxy-modified latex, semi-gloss (MPI Gloss Level 5), MPI #215.

D. Gypsum Board Substrates:

1. Epoxy-Modified Latex System MPI INT 9.2F:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - c. Topcoat: Epoxy-modified latex, semi-gloss (MPI Gloss Level 5), MPI #215.
2. WC-01, Polyurethane Acrylic, spray applied.
 - a. Prime coat: as recommended by manufacturer.
 - b. Topcoat: Wolfgordon ScuffMaster.

END OF SECTION

SECTION 10 14 19
DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Providing cast metal letters as shown on the Drawings.

1.2 ACTION SUBMITTALS

- A. Shop Drawings: Indicate construction materials, finishes, sizes, quantities, and related hardware requirements.
- B. Template: Submit full size template for installation of building letters.

1.3 INFORMATIONAL SUBMITTALS

- A. Instructions: Submit manufacturer's latest installation instructions for information only.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in factory packages with factory labels attached.
- B. Cover and protect material in transit and at job site. Damaged or defaced material will be rejected and replaced at no cost to the Owner.

1.5 COORDINATION

- A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
 1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Subject to compliance with requirements, provide products by one of the following:
 1. A.R.K. Ramos.
 2. ASI Sign Systems, Inc.
 3. Gemini Incorporated.
 4. Metal Arts; Div. of L&H Mfg.

5. Mills Manufacturing, Inc.
6. Mohawk Sign Systems.

2.2 MATERIALS

- A. Aluminum Castings: Provide aluminum castings of alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.
- B. Cast Characters: Form individual letters and numbers by casting. Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Comply with requirements indicated for finish, style, and size.
 1. Text: As indicated on Drawings.
 2. Character Height: As indicated on Drawings.
 3. Character Font: As indicated on Drawings.
- C. Anchors and Inserts: Provide nonferrous metal or hot dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled in place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.3 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.
- D. Aluminum Finish: Manufacturer's standard clear anodic coating, 0.018 mm or thicker, over a polished (buffed) mechanical finish.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

3.2 INSTALLATION

- A. Install sign in accordance with manufacturer's drawings, shop drawings, and specifications.
- B. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
 - 1. Install letters level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
- C. Dimensional Characters: Mount characters using standard fastening methods recommended in writing by manufacturer for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
 - 1. Projected Mounting: Mount characters at projection distance from wall surface indicated, or, if not indicated, 1/2-inch maximum.

3.3 FIELD QUALITY CONTROL

- A. Verify that sign is installed in accordance with manufacturer's instructions.
- B. Tolerances:
 - 1. Out of level: $\pm 1/8$ " for length of text.
 - 2. Out of plumb: $\pm 1/16$ " per letter maximum.
 - 3. Alignment of adjacent member: None.

3.4 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION

SECTION 10 14 23

PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Panel signs.
2. Field-applied, vinyl-character signs.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary informational and directional signs.
2. Section 14 21 00 "Electric Traction Elevators" for code-required conveying equipment signage.
3. Division 22 for labels, tags, and nameplates for plumbing systems and equipment.
4. Division 23 for labels, tags, and nameplates for HVAC systems and equipment.
5. Division 26 for labels, tags, and nameplates for electrical equipment.

1.2 DEFINITIONS

- ###### A. Accessible: In accordance with the accessibility standard.

1.3 COORDINATION

- ###### A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.
- ###### B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

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

- ###### B. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, timesteps, graphic elements, including raised characters and Braille, and layout for each sign at least half size

- C. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Panel Signs: Full-size Sample.
 - 2. Field-Applied, Vinyl-Character Signs: Full-size Sample of characters on glass.
 - 3. Variable Component Materials: Full-size Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
- D. Product Schedule: For panel signs. Use same designations indicated on Drawings or specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 1. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design".

2.2 PANEL SIGNS

- A. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ACE Sign Systems, Inc.
 - b. Advance Corporation.
 - c. Allen Industries Architectural Signage.
 - d. Allen Markings.
 - e. APCO Graphics, Inc.
 - f. ASE, Inc.
 - g. ASI Sign Systems, Inc.
 - h. Best Sign Systems, Inc.
 - i. Bunting Graphics, Inc.
 - j. Clarke Systems.
 - k. Cosco.
 - l. Diskey Architectural Signage Inc.
 - m. Fossil Industries, Inc.
 - n. InPro Corporation (IPC).
 - o. Mohawk Sign Systems.
 - p. Nelson-Harkins Industries.
 - q. Poblocki Sign Company, LLC.
 - r. Seton Identification Products.
 - s. Signs & Decal Corp.
 - t. Stamprite Supersine; a division of Stamp Rite Inc.
 - u. Vista System.
 - v. Vomar Products, Inc.
2. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated over subsurface graphics to acrylic backing sheet to produce composite sheet.
 - a. Composite-Sheet Thickness: Manufacturer's standard for size of sign.
 - b. Surface-Applied, Flat Graphics: Applied vinyl film.
 - c. Surface-Applied, Raised Graphics: Applied polymer characters and Braille.
3. Mounting: Surface mounted to wall.
4. Text and Typeface: Accessible raised characters and Braille.

2.3 FIELD-APPLIED, VINYL-CHARACTER SIGNS

- A. Field-Applied, Vinyl-Character Sign: Prespaced characters die cut from 3- to 3.5-mil thick, weather-resistant vinyl film with release liner on the back and carrier film on the front for on-site alignment and application.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Allen Markings.
 2. APCO Graphics, Inc.
 3. Mohawk Sign Systems.
 4. Seton Identification Products.
- C. Size: As indicated on Drawings.
- D. Substrate: As indicated on Drawings.

- E. Text and Font: As indicated on Drawings.

2.4 PANEL-SIGN MATERIALS

- A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- B. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated on Drawings and suitable for exterior applications.
- C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.5 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following unless otherwise indicated:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. Adhesive: As recommended by sign manufacturer.
 - 3. Adhesives shall have a VOC content of 70 g/L or less.

2.6 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 5. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
 - 6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
 - 7. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.

- B. Shop- and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.
- C. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
 - 1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. Subsequent changeable inserts are by Owner
 - 2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Subsequent changeable inserts are by Owner.

2.7 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.

3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
4. Accessible Signage: Install in locations on walls as indicated on Drawings and according to the accessibility standard.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
4. Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.
5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
6. 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.
7. Field-Applied, Vinyl-Character Signs: Clean and dry substrate. Align sign characters in final position before removing release liner. Remove release liner in stages, and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 10 21 13.17

PHENOLIC-CORE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Phenolic-core toilet compartments configured as toilet enclosures and urinal screens.

B. Related Requirements:

1. Section 10 28 00 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: For toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show overhead support or bracing locations.

C. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hinges: One hinge(s) with associated fasteners.
2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.

3. Door Bumper: One door bumper(s) with associated fasteners.
4. Door Pull: One door pull(s) with associated fasteners.
5. Fasteners: Ten fasteners of each size and type.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: 75 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 ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 PHENOLIC-CORE TOILET COMPARTMENTS

- A. Basis-of-Design Product: ASI; Colorthru Phenolic Partitions or comparable product by one of the following:
 1. Accurate Partitions Corp.; ASI Group.
 2. All American Metal Corp.
 3. American Sanitary Partition Corporation.
 4. Ampco Products, LLC.
 5. Bobrick Washroom Equipment, Inc.
 6. Bradley Corporation.
 7. Columbia Lockers; Partition Systems International of South Carolina.
 8. Decolam.
 9. Flush Metal Partition, LLC.
 10. General Partitions Mfg. Corp.
 11. Global Partitions; ASI Group.
 12. Knickerbocker Partition Corporation.
 13. Marlite.
 14. Metpar Corp.

- B. Toilet-Enclosure Style: Overhead braced/Floor anchored.
- C. Urinal-Screen Style: Wall hung.
- D. Door, Panel, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges and no-sightline system. Provide minimum 3/4-inch-thick doors and pilasters and minimum 1/2-inch-thick panels.
- E. Pilaster Shoes and Sleeves (Caps): Formed from stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.
- F. Urinal-Screen Post: Manufacturer's standard post design of 1-3/4-inch-square, stainless steel tube with satin finish; with shoe and sleeve (cap) matching that on the pilaster.
- G. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.
- H. Phenolic-Panel Finish:
 - 1. Facing Sheet Finish: One color and pattern in each room.
 - 2. Color and Pattern: As indicated by manufacturer's designations, with manufacturer's standard.
 - 3. Edge Color: Through-color matching facing sheet color.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
 - 1. Hinges: Manufacturer's minimum 0.062-inch-thick stainless-steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through-bolts.
 - 2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
 - 3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
 - 4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
 - 5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

- 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, 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 compatible with related materials.

2.4 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless-Steel Castings: ASTM A 743/A 743M.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. 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.
- 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 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.

- b. Panels and Walls: 1 inch.
 - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
 - B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
 - C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.
- 3.3 ADJUSTING
- A. Hardware Adjustment: Adjust and lubricate hardware according to 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 26 00

WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wall Protection Panels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
 - 2. Keep plastic materials out of direct sunlight.
 - 3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
 - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall- and door-protection products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.

2.3 WALL PROTECTION PANELS

- A. FRP, Fiberglass Reinforced Plastic Panels: Fabricated from semirigid, plastic sheet wall-covering material.
 1. Basis-of-Design Product: Provide product listed on Finish Legend or comparable product by one of the following:
 - a. Crane Composites, Inc.
 - b. Glasteel.
 - c. Marlite.
 - d. Newcourt, Inc.
 - e. Nudo Products, Inc.
 - f. Parkland Plastics, Inc.
 2. Size: 52 inches.
 3. Color and Texture: As selected by Architect from manufacturer's full range.
 4. Height: As indicated.
- B. Trim Accessories: Manufacturer's standard one-piece or two-piece, snap-on vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
 1. Color: Match panels.
- C. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.
- D. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.

- E. Adhesive: As recommended by plastic paneling manufacturer.
 - 1. Adhesives shall have a VOC content of 50 g/L or less.
- F. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 07 92 00 "Joint Sealants."

2.4 FABRICATION

- A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.
 - 1. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- B. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.5 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings.
- C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
 - 1. Provide anchoring devices and suitable locations to withstand imposed loads.
 - 2. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches apart.
- D. Wall protection panels: Install top and edge moldings, corners, and divider bars as required for a complete installation.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION

SECTION 10 28 00

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Toilet and bath accessories.
2. Childcare accessories.
3. Custodial accessories.

B. Related Requirements:

1. Section 08 83 00 "Mirrors" for frameless mirrors tagged as TA-12 and TA-13.

1.2 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.

B. Samples: For each exposed product and for each finish specified, full size.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

D. Delegated-Design Submittal: For grab bars and shower seats.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.6 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, visible silver spoilage defects.
 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OWNER FURNISHED, CONTRACTOR INSTALL

- A. Shower Curtains.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Design accessories and fasteners to comply with the following requirements:
1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.
 2. Shower Seats: Installed units are able to resist 250 lbf applied in any direction and at any point.

2.3 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide accessories by one of the following:
1. Toilet and Bath Accessories:
 - a. American Specialties, Inc.
 - b. Bobrick.
 - c. Bradley.
 - d. GAMCO.
 2. Infant-Care Products:
 - a. Bobrick.
 - b. Bradley.
- B. Products: provide one of the products indicated for each designation in the Toilet and Bath Accessory Schedule at the end of Part 3.

2.4 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
 - 1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.
- C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Clean and polish exposed surfaces according to manufacturer's written instructions.

3.3 TOILET AND BATH ACCESSORIES SCHEDULE

- A. TA-2, Paper Towel Dispenser, Recessed:
 - 1. Material: Stainless steel; 22 gage.
 - 2. Construction: Welded door with continuous stainless steel piano hinge; 1 tumbler locks.
 - 3. Mounting: Recessed.
 - 4. Dispenser Capacity: 350 C-fold or 475 multi-fold paper towels.
 - 5. Basis of Design Products:
 - a. Bobrick B-359.
 - b. Bradley 2441.
- B. TA-4, Sanitary Napkin Disposal, Partition:
 - 1. Material: Stainless steel, 22 gage door and flanges.
 - 2. Construction: All-welded with continuous stainless steel piano hinge.
 - 3. Door: Push type, self-closing.
 - 4. Mounting: In toilet partition serving two compartments.
 - 5. Receptacle: Leak proof, plastic, removable; capacity 1.2 gallons.
 - 6. Basis of Design Products:

- a. Bobrick B-354.
 - b. Bradley 4721-15.
- C. TA-7, Toilet Tissue Dispenser, Double Roll:
1. Material: Die cast aluminum with molded high-impact ABS spindles with concealed locking mechanism, and uncontrolled delivery.
 2. Capacity: Two standard core tissue rolls up to 6 inches diameter.
 3. Mounting: Surface.
 4. Basis of Design Products:
 - a. Bobrick B-2740.
 - b. Bradley 5241-50.
- D. TA-9, Grab Bars:
1. Sizes: Refer to Drawings.
 2. Material: Stainless Steel, 18 gage, type 304, satin finish.
 3. Construction: 1-1/2 inch clearance between grab bar and wall.
 4. Mounting: Concealed plates with no exposed fasteners.
 5. Basis of Design Products:
 - a. Bobrick B-6806.
 - b. Bradley 812.
- E. TA-10, Grab Bar, Two Wall:
1. Size: Refer to Drawings.
 2. Material: Stainless steel.
 3. Construction: 1-1/2 inch clearance between grab bar and wall.
 4. Mounting: Concealed plates with no exposed fasteners.
 5. Basis of Design Products:
 - a. Bobrick B-68616.
 - b. Bradley 8120-059.
- F. TA-12A, LED Backlit Mirror Unit (dressing vanity):
1. Basis-of-Design Product: Bobrick; B-168.
 2. Materials:
 - a. Glass: 1.5mm thick safety mirror with 0.14mm PVC film backer with frosted sandblasting.
 - b. Mounting Channel: extruded, clear anodized aluminum channel with mounting holes.
 3. Electrical Requirements: 120V circuit, UL labeled.
- G. TA-11, Robe Hook:
1. Basis-of-Design Product: Bobrick-76727.
 2. Description: Double-prong unit.
 3. Material and Finish: Stainless steel, No. 4 finish (satin).

- H. TA-15, Mop and Broom Holder:
 - 1. Basis-of-Design Product: Bobrick; B-239.
 - 2. Description: Unit with shelf, hooks and holders.
 - 3. Length: 34 inches.
 - 4. Hooks: Four.
 - 5. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
 - 6. Material and Finish: Stainless steel, No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch-thick stainless steel.
- I. TA-16, Diaper-Changing Station:
 - 1. Basis-of-Design Product: Bobrick KB110-SSRE.
 - 2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
 - a. Engineered to support minimum of 250-lb 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), with replaceable insulated polystyrene tray liner and rounded plastic corners.
 - 6. Liner Dispenser: Built in.
- J. TA-18, Shower Rod:
 - 1. Material: Stainless steel, 18 gage, type 304, satin finish.
 - 2. Size: 1 inch diameter, lengths as detailed on Drawings.
 - 3. Mounting: Surface with concealed mounting.
 - 4. Basis of Design Products:
 - a. Bobrick B-6107.
 - b. Bradley 9538.
- K. SCR-01, Shower Curtain Liner and hooks: White plastic liner and hooks.
 - 1. Basis-of-Design Products:
 - a. Liner: Bobrick 204-3.
 - b. Hooks: Bobrick 204-1.
 - c. Owner to provide Shower Curtain, contractor to install.
- L. TA-20, Folding Shower Seat:
 - 1. Materials: Plastic and stainless steel.
 - 2. Configuration: L-shaped seat, designed for wheelchair access.
 - 3. Seat: Phenolic composite, one-piece construction, reversible.
 - 4. Basis of Design Products: Refer to Drawings for selection.
 - a. Bobrick B-5181.
 - b. Bradley 9562.

- M. TA-22, Heavy-Duty Towel and Robe Hook:
 - 1. Material: Satin nickel plated finish.
 - 2. Mounting: Surface, concealed
 - 3. Basis of Design Products:
 - a. Bobrick B-2116.
 - b. Bradley 9119.
- N. TA-24, Surface Mounted Shelf:
 - 1. Material: 18 gage stainless steel with exposed surfaces satin finish.
 - 2. Construction: All corners heliarc welded and ground smooth.
 - 3. Size: 5 inches wide. Refer to Drawings for lengths.
 - 4. Basis of Design Products:
 - a. Bobrick B-295.
 - b. Bradley 755.
- O. TA-28, Toilet Seat Cover Dispenser:
 - 1. Material: 22 gage stainless steel.
 - 2. Mounting: Surface.
 - 3. Construction:
 - a. Surface Mounted: All welded; no hinge or lock.
 - 4. Capacity:
 - a. Surface Mounted 500 paper toilet seat covers.
 - 5. Basis of Design Products:
 - a. Surface Mounted: Bobrick B-221 or Bradley 5831.
- P. TA-29, Lavatory Mounted Soap Dispenser:
 - 1. Description: Designed for dispensing soap in liquid or lotion form.
 - 2. Mounting: Deck mounted on vanity or on lavatory, as indicated.
 - 3. Capacity: Minimum 32 fluid ounces.
 - 4. Materials: Type 304 stainless steel and plastic.
 - 5. Basis of Design Products:
 - a. Bobrick B-8226.
 - b. Bradley 6326-68.

END OF SECTION

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.
 - 2. Portable fire extinguishers.

1.2 PREINSTALLATION CONFERENCE

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to fire-protection cabinets including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Fire Protection cabinets and fire extinguishers: Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Product Schedule: For fire-protection cabinets. Indicate whether recessed or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 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. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Products: Oval Fire Products; Fire Extinguisher Cabinet.
- B. Cabinet Construction: Cabinet shall match fire rating of wall construction that cabinet is installed within.
 - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch-thick cold-rolled steel sheet lined with minimum 5/8-inch-thick fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: Cold-rolled steel sheet.
 - 1. Shelf: Same metal and finish as cabinet.
- D. Recessed Cabinet:
 - 1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
- E. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.
- F. Cabinet Trim Material: Same material and finish as door.
- G. Cabinet Color: Red.
- H. Door Material: Steel sheet.
- I. Door Style: Fully glazed panel with frame
- J. Door Glazing: Tempered float glass (clear).
- K. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide manufacturer's standard.
 - 2. Provide manufacturer's standard hinge permitting door to open 180 degrees.

L. 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. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
3. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Decals.
 - 3) Lettering Color: White.
 - 4) Orientation: Vertical.
5. Alarm: Manufacturer's standard alarm that actuates when fire-protection cabinet door is opened and that is powered by batteries.

M. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel or powder coat.
 - b. Color: As selected by Architect from full range of industry colors and color densities.
2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.3 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
1. Manufacturers: Oval Fire Products; Fire Extinguisher.
 2. Valves: Manufacturer's standard.
 3. Handles and Levers: Manufacturer's standard.
 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Aluminum Container: UL-rated 4-A:80-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-aluminum container.

2.4 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.

2. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 2. Fabricate door frames of one-piece construction with edges flanged.
 3. Miter and weld perimeter door frames.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- B. Examine fire extinguishers for proper charging and tagging.
 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION-FIRE PROTECTION CABINETS

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification: Apply decals at locations indicated.

3.4 INSTALLATION-FIRE EXTINGUISHERS

- A. General: 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.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

3.5 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 11 40 00

FOODSERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. This section constitutes a separate prime contract.
- B. The general conditions of Division 1, including an invitation to bid, proposal form, instructions to bidders, supplementary conditions, and general requirements apply to the work specified in this section.

1.2 RELATED WORK NOT INCLUDED BY FOODSERVICE EQUIPMENT CONTRACTOR

- A. All plumbing, electrical, and ventilation work, labor, and material required to connect this equipment is to be furnished by other trades unless specifically called for in the "Schedule of Equipment". The work done by other trades is to include roughing-in to points indicated on roughing-in plans, final connecting from rough-in point to various pieces of equipment requiring such connections, and the supplying of all necessary materials and labor for this work except as hereinafter noted.
- B. Refrigeration work done by Equipment Contractor is hereinafter listed in itemized specifications, except for electrical and plumbing connections to the compressor, evaporator coils, lights, controls, etc. This work is to be accomplished by other Contractors and includes interior wiring in walk-in refrigerated storage rooms and drain extensions from fixtures to floor drains and floor sinks. Any sleeves or conduit required for refrigeration and tubing lines shall be furnished and installed by others. Refrigeration alarm system connection by others.
- C. Plumbing/Mechanical/HVAC – Division 22 0000/23 0000
 - 1. Rough-in for all new equipment.
 - 2. Piping of supply and waste lines from building service to rough-in (unless specifically stated otherwise).
 - 3. Traps, grease traps, line strainers, tailpieces, valves, stops, shut-offs, and miscellaneous fittings required for complete installation.
 - 4. All ductwork and fans above ceiling line including connection to ventilators and/or hoods.
 - 5. Final connections to equipment.
 - a. Plumbing trades to confirm all lines are flushed free of foreign matter before connecting equipment.
- D. Electrical – Division 26 0000
 - 1. Rough-in for all new equipment.
 - 2. All electric building services including, but not limited to conduit, wiring, line, and disconnect switches, safety cut-offs and fittings, control panels, fuses, boxes, and fittings required for a complete installation, except internal wiring as specified, unless indicated otherwise on drawings. Provide grounded receptacles furnished with stainless steel faceplates.

3. Final connections to equipment, including mounting and wiring of starters and switches, furnish as part of the foodservice equipment (unless otherwise indicated on drawings).
 - a. It shall be the responsibility of the electrical trades to check all equipment to determine where starters, contractors, switches, and other items are required.
- E. The General Contractor shall provide a structure sufficient to sustain the weight of the Foodservice Equipment and depressed slabs for drains grates and walk-in cooler/freezer when noted. Openings and passageways of sufficient size to permit the delivery and erection of the equipment to their respective locations without dismantling shall also be provided. Coordination of these conditions is critical to the equipment installation.
- F. Except when called for in these written specifications, tile and/or coved bases in foodservice areas shall be provided by the General Contractor. Refer to architectural drawings and specifications for details.

1.3 SCOPE OF WORK

- A. Furnish all labor, material, services, and specified equipment necessary for the complete installation of foodservice equipment in strict accordance with specifications, applicable drawings, and local codes, including that which is reasonably inferred, with all related items necessary to complete work shown on contract drawings and/or required by these specifications. Uncrate, assemble, hang, set in place, level, and completely install all equipment, exclusive of final utility connections.
- B. The Foodservice Equipment Contractor (FSEC) shall have a competent foreman on the premises to assist in furnishing information and supervising the installation of equipment under this section.
- C. Assume full responsibility for verifying all field dimensions as they pertain to the work in this section.
- D. Supervise and inspect the services of the respective Plumbing, Mechanical, and Electrical Contractors when connecting new equipment being supplied under this Contract.
- E. Equipment delivery:
 1. Plan for receiving equipment and delivering equipment on schedule. The Foodservice Equipment Contractor shall be responsible for coordinating all aspects of their work as it relates to the General Contractor, Subcontractors, the Owner, or any other Trades as may be dictated by the Owner, Architect, or Consultant.

2. Confirm that the General Contractor has provided a structure sufficient to sustain the weight of the Foodservice Equipment and depressed slabs for drains grates and walk-in cooler/freezer when noted. Confirm that openings and passageways of sufficient size to permit the delivery and erection of the equipment to their respective locations without dismantling are provided. Assume responsibility for any equipment that must be entered through openings before doors and walls are finished. Coordination of these conditions is critical to the equipment installation.
3. Establish earliest and latest job site delivery dates of the Foodservice Equipment Contractor provided equipment.
4. Do not consign any equipment to the Owners or to any other Contractor without written acceptance from them and satisfactory arrangements for the payment of freight and all handling charges.
5. Delivery of Owner furnished equipment for installation shall take place at a time to be determined by Owners, but not necessarily during normal working hours.

F. Installation:

1. Uncrate, assemble, and level equipment. Repair any damaged or abraded surfaces. Set equipment temporarily in its final locations, permitting the plumbing, mechanical and electrical trades to take the necessary measurements for the connection of the service lines. Then, move the equipment sufficiently to permit the installation of such service lines. After service line installation, realign equipment level and plumb, making the final erection as shown on the contract drawings.
2. Equipment shall be installed to eliminate objectionable vibration.
3. Be responsible for the cutting of holes in equipment for pipes, drains, electric outlets, etc., as required to allow for efficient utility connections to equipment. Work shall conform to the highest standards of workmanship and shall include welded sleeves, collars, ferrules, or escutcheons.
4. Provide wall sleeves, chrome-plated cover plates, vermin proofing, and sealing of wall sleeves. Foodservice Equipment Contractor to provide vermin proofing for all floor sleeves they use.
5. Equipment shall be turned over to the Owner in undamaged condition upon completion. All workmanship and labor shall be of the best in their respective fields with skilled mechanics of the trades involved.

G. Electrical work:

1. Provide inter-wiring of foodservice equipment between components within the equipment, such as heating elements, switches, starters, thermostats, motors, etc., complete with a junction box or disconnect as is applicable and ready for final connection.
2. All electrical inter-wiring done in the fabricator's shop or in the field as specified in this scope of work shall be fully tested and certified by a licensed independent agency. Testing agencies shall be approved by the local authorities.
 - a. A complete wiring diagram indicating connection points, types of conduit, junction boxes, terminal boxes, breaker panels, shunt-trip breakers for cooking equipment, and other miscellaneous devices shall be listed in the fabricator's shop drawings.

- b. The agency's name and contact person, as well as verification that the agency is accepted by local inspectors, shall be submitted to the Consultant prior to fabrication of custom equipment.
 3. Voltages shall be as indicated on contract drawings. Any differences in electrical characteristics at a job site from those shown on contract documents must be submitted to the Consultant for consideration prior to ordering equipment.
 4. Furnish on each motor-driven appliance or electrically heated unit a suitably mounted control switch or starter of proper type in accordance with UL or ETL Codes. All controls mounted on vertical surfaces of fixtures shall be set into recessed die-stamped stainless-steel cups or otherwise indented to prevent damage to the control switch.
- H. Plumbing work:
 1. Furnish equipment with faucets, mixing valves, back-flow preventers, and/or sink waste assemblies as specified in this section. All backsplash-mounted faucets shall be provided with double male nipples having locknuts for rigidly securing the faucet to the backsplash. Nipple-locknut assembly shall be provided under this section as part of the faucet.
 2. Pre-pipe all waste and supply piping for built-in fixtures in fabricated counters to shut off or control valves, ready for final connection by the General Contractor. Final connections will be by the General Contractor unless otherwise specified.
- I. Walk-in refrigeration:
 1. Walk-in refrigeration units shall be erected by factory-trained and certified installers or shall be supervised by factory personnel. Remote refrigeration systems shall be furnished by a walk-in refrigeration unit manufacturer and installed by factory-authorized personnel.
 2. Provide junction boxes, one for each unit section, to connect service for lights and heater cable. The project electrician shall make connections from electric panels to control panels on compressors and to respective junction boxes.
 3. Provide control wiring between evaporator units, compressor units, and related control items. All wiring shall be copper run through a rigid PVC conduit. Wiring and conduits sizing shall conform to the requirement of The State of Georgia Electric Code.
 4. All conduits inside of units shall be of "Seal-Tite" type.
 5. Conduits, wiring, and refrigerant lines shall be concealed within the walls, ceilings, and floors of the building.
 6. Testing and initial operation of this equipment will be supervised by a qualified representative of the balanced refrigeration system manufacturer.
- J. At no expense to the Architect or Owner, provide on-site operational and functional testing of the installed equipment. Defects or deficiencies will be corrected to the satisfaction of the Architect or Owner at the expense of the Foodservice Equipment Contractor.
- K. Consult the mechanical, plumbing, and electrical drawings and their accompanying specifications to determine additional requirements of the work. Cooperate with all trades to ensure a satisfactory installation.

- L. Repair damage to the equipment and/or premises resulting from this installation and remove, daily, any debris left by the Foodservice Equipment Contractor. Dispose of all packaging and debris per the Architect's Construction Waste Management Plan.
- M. Be responsible for keeping their area orderly during the entire time of installation. Foodservice equipment and fixtures shall be cleaned thoroughly and ready for operation at the time the building is turned over to the Owner.
- N. Protect metal and millwork product finishes from damage during shipping, storage, handling, installation, and construction of other work in the same spaces. Wrap with self-adhesive protective paper of a type recommended by the metal and millwork manufacturer and crate each item of equipment as needed for protection from damage. Do not remove protective coverings until work is installed and ready for cleaning and start-up.
- O. Become familiar with and accept responsibility for compliance with all applicable codes and regulations. If authorities having jurisdiction require any portion of the equipment to be inspected, tested, or approved, the Foodservice Equipment Contractor and/or their equipment supplier shall bear all costs of such inspections, tests, or approvals.
- P. Procure and deliver certificates of acceptance or of completion as required and issued by the State, Municipal, or other authorities to the Owner. The certificate shall be filed with the Architect certifying that the equipment is operating based on the manufacturer's recommendations. Coordinate the performance of these services, and both the manufacturer's representative and the Foodservice Equipment Contractor shall sign the certificate. The Owner may withhold payments that are due or which may become due until the necessary certificates are procured and delivered.
- Q. Use sealant, wherever required, for sealing backsplashes to walls, cabinet bodies to concrete or tile bases, roll-in refrigerators to floors. Etc. Sealant shall be Dow-Corning #780, General Electric "Silastic", or approved equal in a clear finish and applied in accordance with the sealant manufacturer's recommendations. Gaps between the wall and backsplash over 1/4-inch wide are not acceptable.
- R. Coordinate equipment noted as being provided by the Owner or other product supplier. Do not install unless specifically directed to do so in the written specifications. Show on roughing-in plans the sizes, utilities, and other requirements provided in the specifications as if the equipment were contractor furnished.
- S. Verify size and weight information of all service ware (glasses, plates, trays, cups, etc.) with the Owner. Verify carts, racks, and dollies fit into fixed equipment such as roll-in refrigeration, combi ovens, walk-in refrigeration, counters etc.
- T. Take full responsibility for any costs resulting from changes or variances from contract drawings and written specifications without written authorization from Architect and/or Consultant for said changes or variances.

1.4 QUALITY ASSURANCE

- A. All custom fabricated equipment such as tables, sinks, countertops, etc., must be manufactured by a foodservice equipment fabricator who has the facility, personnel, and engineering capability to meet the design requirements. Such manufacturer shall be subject to the approval of the Consultant. All work in the above category shall be manufactured by one manufacturer and shall be of uniform design and finish.
- B. The provider of this equipment must be able to show that he is now and for the past 5 years been engaged in the manufacture or distribution of foodservice equipment, as required under this Contract.
- C. Only manufacturers who can meet the foregoing qualifications will be acceptable. Approved fabricators are listed in the "Fabricated Metal Equipment" section of this specification.
- D. Obtain equipment of like families (refrigeration, ovens, serving counters, etc.) from a single manufacturer.
- E. Foodservice equipment is to be supplied by a single Foodservice Equipment Contractor. Contractors bidding the equipment specified in this section represent and warrant that:
 - 1. They are financially solvent.
 - 2. They are experienced in and competent to perform the types of work to furnish the plans, materials, supplies, and/or equipment to be so performed or furnished herein.
 - 3. They are familiar with all federal, state, municipal, and department laws, ordinances, orders, and regulations which may affect the work of those employed therein, including, but not limited to any special acts relating to the work or to the project of which it is a part.
 - 4. Such temporary and permanent work required by the Foodservice Equipment Contractor can be satisfactorily constructed and used for the purpose for which it is intended and that such construction will not injure any person or damage any property.
 - 5. They have carefully examined the plans, specifications, addenda if any, and the site of the work and that, from their own investigations, they have satisfied themselves as to the nature and location of the work; the character, quality, and quantity of materials likely to be encountered; the character of equipment and other facilities needed for the performance of the work; the general and local conditions; and all other materials which may, in any way, affect the work or its performance.
- F. Pre-approved Foodservice Equipment Contractors to include:
 - 1. Edward Don & Company: 1-800-777-4366
 - 2. Thompson and Little Foodservice Equipment & Supplies: 910-484-1128
 - 3. Fadel Food Services Equipment & Supplies: Toll-Free 1-800-44-Fadel
 - 4. Trimark Foodservice Equipment Supplies & Design 708-496-1700
 - 5. Mobile Fixture 251.342.0455 / 800.345.6458
 - 6. H & R Restaurant Supply 205.409.0097 / 888.364.4080
 - 7. Manning Brothers Food Equipment Co.: 1-800-554-3004
 - 8. Boelter Foodservice Design, Equipment & Supply: 800-263-5837

1.5 SUBMITTALS

- A. Refer to Division 01 requirements for Submittals.
- B. The item numbers shown on the submittal shall be the same as shown on contract documents. All submittals are to be in electronic (PDF) format. Reproduction of original contract documents is not acceptable for this purpose.
- C. Equipment brochure:
 - 1. Submit illustrated brochures for manufactured or "buy-out" equipment items, line drawings, rough-in requirements, and list of accessories or other specified additional requirements. Include items listed as "Future, Existing to Remain, Existing to be Relocated, and/or By Owner." Omission of data does not reduce the obligation to provide items as specified.
 - 2. The equipment cut sheets shall use Auto Quotes or similar, including coversheets for each item. Where a piece of equipment is used and specified with multiple item numbers assigned, the first item is to be provided with a cover sheet and datasheet. For additional identical items, provide cover sheets only.
 - 3. On the brochure cover sheet, provide the following information:
 - a. Project name.
 - b. FSEC name.
 - c. Foodservice Consultant name.
 - 4. On equipment cover sheets, provide the following information:
 - a. Item Number.
 - b. Equipment description.
 - c. Quantity.
 - d. Written specification/description of equipment provided.
 - e. Accessories.
 - f. Utilities.
- D. Rough-In drawings:
 - 1. Submit fully dimensioned rough-in plans at 1/4" scale, in electronic format, showing all required mechanical, electrical, ventilation, water, waste, and refrigeration services required for equipment and rough-in location for same. Rough-in locations shown shall make allowances for required traps, switches etc., thereby not requiring interpretations or adjustment on the part of other contractors. Drawings shall indicate dimensions for floor depressions, raised bases, wall openings, wall backing, recessed or wall-mounted control panels, etc., for equipment.
 - 2. Drawings shall be dimensioned to the stub up or stub out, not to the connection on the equipment. 90-degree plug heads are recommended where available. Verify all NEMA plug types and lengths of cords from equipment. Length is to be of adequate distance for outlets available and to allow equipment to be placed as shown on contract documents. Show convenience receptacle locations.
 - 3. In the event rough-in has been completed before award of Contract, the Foodservice Equipment Contractor shall field verify the provided rough-in locations and provide equipment to suit building conditions.

4. Provide a refrigeration system schematic piping plan indicating line size, elevation, trap locations, and all specified components required for the refrigeration system installation. The plan is to include equipment and parts provided by the remote refrigeration manufacturer. Verify refrigeration sizing is proper for line lengths determined by actual field conditions.
- E. Shop drawings:
1. Submit fully dimensioned and detailed shop drawings, in electronic format, of custom-fabricated equipment including, but not limited to stainless steel fabrication, walk-in cooler/freezer, remote refrigeration, exhaust hoods, utility distribution systems, and scullery equipment shall be submitted, drawn at 3/4" scale for elevations and 1-1/2" scale for sections. Drawings to show item number and quantity required for each detail. Omissions shall not relieve the Foodservice Equipment Contractor of providing items as specified and shown on contract drawings.
 2. Show adjacent walls, columns, and identify countertop equipment showing item numbers and descriptions. Drawings shall show details of construction, installation, and relation to adjoining and related work where cutting or close-fitting is required.
 3. Drawings shall indicate species and grades of materials, gauges, finishes, and hardware selections. Provide color, pattern, and/or samples for laminate, fiberglass, paint, or stain for approval by the Architect/Owner.
 4. Drawings shall show all reinforcements, anchorage, and other work required for the complete installation of all fixtures.
 5. Where the fabricator is to pre-wire components to a junction box, pull box, breaker panel, load center, etc., all electrical wiring, labeling, and method of certification are to be indicated on the drawings. Provide an electrical diagram to the on-site Electrical Contractor.
- F. Submit certification for special materials as applicable:
1. Walk-In refrigeration manufacturer will have received UL Seal of Approval and Factory Mutual's test approval for low CFC foam construction. The Foodservice Equipment Contractor shall submit a sample of the approval certificates for verification.
 2. Preservative treated wood certification: submit for Architect's information only. Submit certification by treating plant stating chemicals and process used, the net amount of salts retained, conformance with applicable standards, and moisture content after treatment.
 3. Fire-retardant treatment certification: submit for Architect's information only. Submit certification by treating plants that fire-retardant treatment materials comply with governing ordinances and that treatment will not bleed through finished surfaces.
- G. Verify utility and other special requirements of foodservice equipment with plumbing, mechanical, and electrical plans prior to ordering equipment.

- H. Rough-in drawings shop drawings, color, and material samples and bound brochures covering manufactured or "buy-out" items covering all work and equipment covered in this Contract shall be submitted to the Consultant and Owner as soon as possible but not later than four (4) weeks after the award of Contract. After approval, Foodservice Equipment Contractor shall furnish to Consultant, Architect and Owner, sets (as required) of shop drawings and brochures, corrected as required by virtue of review comments, for distribution to various interesting trades on the project. All costs of reproductions and submissions shall be part of the Contract.
 - I. After initial review of submittal data, revise and resubmit only the datasheet, coversheets, rough-in, and/or shop drawings that have been revised. The entire submittal is not required for resubmission. After two resubmissions, the Foodservice Equipment Contractor may be charged a fee for the Consultant's continuous re-evaluation. This will be billed as an additional service.
 - J. Do not begin fabrication of custom equipment until approvals of shop drawings have been received and until field measurements have been taken by Foodservice Equipment Contractor, where such measurements are necessary to assure proper conformance with the intent of the contract drawings and specifications.
 - K. Field verify measurements, giving due consideration to any architectural, mechanical, or structural discrepancies that may occur during the construction of the space. Do not rely on or measure drawings for actual on-site dimensions. No extra compensation will be allowed for any difference between actual dimensions secured at the job site and dimensions shown on the drawings. Field dimensions shall be taken at the earliest opportunity so as not to delay deliveries and shall be submitted to the Consultant for consideration before proceeding with the fabrication of equipment.
 - L. Shop drawings, details, and equipment reviewed are for a design concept only and does not relieve the Foodservice Equipment Contractor of responsibility for compliance with design drawings, details and specifications, verification of utilities with equipment requirements for conformity and location, and verification of all dimensions of equipment and building conditions or reasonable adjustments due to deviations. All verifications should occur prior to ordering equipment.
 - M. The Foodservice Equipment Contractor shall prepare and submit for review a complete and itemized listing of items and services ordered, procured, and otherwise arranged for to complete their work, including purchase order numbers, projected ship dates, and pertinent comments. This listing shall be updated and distributed on a bi-monthly basis and on a weekly basis during the four (4) week period preceding the commencement of installation.
- 1.6 SUBSTITUTIONS – STANDARDS
- A. Refer to Division 01 requirements for Substitutions.

- B. Where equipment is specified by the name of manufacturer and model number, it is intended that the designated name and number represent a standard of quality and is not intended to restrict competition in any way. The Architect reserves the right to accept or reject each proposed substitution, and any construction detail or evasion of the specification requirements shall be cause for rejection. Such a decision shall be final and binding upon all parties. Acceptance of proposed substitutions is subject to the following qualifications:
1. Equal in quality of material used, in structural strength, and in details of construction.
 2. Equal in performance and productivity.
 3. Equal in the finish or in characteristics permitting specified finish to be applied.
 4. Equal availability of replacement parts and maintenance service.
 5. Equal in utility connection requirements.
- C. Proposals shall be based on brands, materials, and forms of construction specified unless products of other manufacturers that conform to requirements of the plans and specifications are approved in writing by the Consultant as equal to that specified. All proposed equipment substitutions shall be submitted at least ten (10) days prior to the date of the bid to the Architect where the bidding schedule allows, and all substitutions require pre-bid approval.
- D. Any equipment offered for approval as "equal" to equipment specified must conform to the space limitations of the layout. Bidders recommending substitutions are cautioned to examine the plumbing, mechanical, and electrical plans as well as conditions at the building site to determine if substitution will require changes in services already planned or installed. The bidder shall include the costs of these changes in their bid and call it to the attention of the Architect and Consultant by including a descriptive notation in the request for approval. In addition to any costs associated with the substitution, the cost of any deviation from kind or location of utility service due to furnishing of an approved equal will be the responsibility of the Foodservice Equipment Contractor, at no extra cost to the Owner.
- E. The bid price for each proposed substitute shall include all costs required to incorporate the substitute into the project. Later requests for additional monies due to substitutions will not be considered.
- F. If no equals are approved in writing by the Consultant, the brands and materials specified must be furnished, and no other substitution will be permitted after awarding of Contract except by specific change order issued by Owner.

1.7 DRAWINGS

- A. Drawings that constitute part of the contract documents indicate the general arrangement of piping and location of equipment. Slight changes due to the varying dimensions of equipment and wall construction shall be permitted with approval by the Architect. Should it be deemed necessary to deviate from the arrangement indicated to work with structural or other field conditions, the Foodservice Equipment Contractor shall provide revised drawings showing such deviations, at their own expense and without expense to the Owner.

- B. These typed specifications shall be closely correlated with the contract drawings. Each complements the other, and cross-referencing shall be necessary to fulfill the requirements of the specifications. All information shown on contract drawings is to be incorporated as part of the written specifications.
- C. Equipment model numbers include the code *C013, as a suffix. This code is known as the Specifier Identification System. It is not to be removed by the bidders. Its purpose is to identify the specifier to the contractors providing the equipment in the event it is necessary to communicate questions, clarifications, and/or comments. It is to be used on all correspondence when communicating with manufacturer representatives and factories.
- D. Specifications and drawings are reasonably exact, but their extreme accuracy is not guaranteed. Drawings and specifications are for the assistance and guidance of the Foodservice Equipment Contractor, and exact locations, distances, and levels shall be governed by the building. Conflict in drawings and specifications where changes, alterations, additions, or deductions are necessary or where exceptions are taken regarding sizes, locations, and other details shown on drawings shall be reported in writing for decision by the Architect.
- E. It shall be the responsibility of the foodservice equipment bidders to inform the Architect and Consultant of any discrepancies found within these documents, including written specifications, drawings, or schedules. This is to allow an opportunity for the Consultant to prepare an addendum to correct such discrepancies. Bidding on a known discrepancy with the intention of equipment substitution or price gouging through change orders will not be tolerated.

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. Equipment specified herein shall be fabricated to conform to the "Food Equipment Standards" of the National Sanitation Foundation (NSF). Equipment shall be installed in accordance with the standards of NSF and bear the NSF seal. This shall include any pending standards which shall become applicable at the time equipment is delivered. Any differences of opinion on sanitation shall be referred to the State Department of Health for a ruling.
- B. Equipment shall be installed in accordance with the manufacturer's instructions and the best practices of the foodservice industry, with careful attention to eliminating all cracks, crevices, and concealed spaces in wet areas that would be difficult to clean or keep free of vermin and soil.
- C. Foodservice equipment provided under this Contract shall be manufactured and installed in conformance with the Williams-Steiger Occupational Safety Health Act of 1970.

- D. Work and materials shall follow requirements of applicable codes, ordinances, and regulations, including but not limited to those of The National Fire Protection Association, State Fire Marshall, State Board of Health, Local Health Codes, etc.
- E. Electrically operated and/or heated equipment, fabricated or otherwise, shall conform to the latest standards of the National Electric Manufacturers Association (NEMA). Equipment shall comply with the State of Georgia Electric Code and bear the label from an approved testing laboratory (UL or ETL).
- F. The electrical wiring of motors, motor starters, switches, and thermostats of the equipment shall be an integral part of the unit, which shall contain a junction box for the connection of electrical service. All motor-driven equipment shall have thermal overload and underload protection.
- G. Gas burning equipment to be designed for operation with a type of gas furnished and approved by the American Gas Association. The label or listing of the American Gas Association shall be accepted as conforming to this requirement. Installation of equipment shall conform to the standards as set forth by the American Gas Association and the National Plumbing Code. All gas-fired equipment shall have automatic ignition. Where required, all gas equipment shall be furnished with a safety pilot and one hundred percent safety cut-off.
- H. NFPA Codes 13, 17, 17A, and 96 standards shall be complied with for the exhaust system. Provide all safety devices on all accessories required to comply with regulations and governing codes.
- I. All standard steam-heated equipment shall be manufactured in accordance with ASME code requirements and carry the ASME stamp.
- J. Walk-in refrigeration unit panels shall meet ASTM E-84 (UL-723) and be listed by Underwriters laboratories and by Factory Mutual as a Class I building material.
- K. Applicable standards comply with the following, as referenced herein:
 - 1. American Institute of Timber Construction (AITC).
 - 2. American National Standards Institute (ANSI).
 - 3. American Plywood Association (APA).
 - 4. American Society for Testing And Materials (ASTM).
 - 5. American Wood Preservers Association (AWPA).
 - 6. American Wood Systems (AWS)
 - 7. Architectural Woodwork Institute (AWI) "Architectural Woodwork Quality Standards, Guide Specifications, and Quality Certification Program", Sixth Edition, 1994, herein referred to as AWI standards. Work shall comply with applicable portions of AWI standards.
 - 8. Hardwood Plywood Manufacturers Association (HPMA).
 - 9. National Electric Manufacturers Association (NEMA).
 - 10. National Fire Protection Association (NFPA)
 - 11. Underwriters Laboratories, Inc. (UL).
 - 12. US Dept. of Commerce, National Bureau of Standards
 - a. Lumber: PS 20-70.
 - b. Construction and Industrial Plywood: PS 1-83.

- L. Whenever the drawings and specifications require larger sizes or higher standards than are required by the regulations, the drawings and standards shall govern.
- M. Whenever the drawings and specifications indicate requirements that will violate the regulations, the regulations shall govern.
- N. No extra charge will be paid for furnishing safety devices or other items required by the regulations, but not specified or shown on the drawings.
- O. Rulings and interpretations of enforcing agencies shall be considered part of regulations.

1.10 WARRANTY

- A. All new equipment specified in this section shall be guaranteed in writing for a period of one (1) year from the date of final acceptance. Any defect in material or workmanship shall be promptly rectified by the Foodservice Equipment Contractor without cost to the Owner during this period.
- B. Walk-in refrigeration units specified in this section shall be guaranteed in writing for a period of ten (10) years from the date of final acceptance. Any defect in material or workmanship shall be promptly rectified by the Foodservice Equipment Contractor without cost to the Owner during this period.
- C. All new self-contained or remote refrigeration systems in this section shall include start-up and a one (1) year service contract providing free service, 24 hours per day, seven days per week, including all parts and labor. Compressors shall be covered by the manufacturer's optional extended warranty, giving components a minimum of five (5) years of warranty protection.
- D. Assign any warranties longer than one (1) year to the Owner at the end of the first year.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless steel shall be austenitic steel alloy and must meet the requirements of the American Iron and Steel Institute Designations for type 304 stainless steel. Type 430 stainless steel (straight chrome - no nickel) shall not be accepted for custom fabricated equipment.
- B. Stainless steel sheets shall be manufactured to the standards set forth by the US Standard for Sheet Metal and have a genuine mill finish of not less than commercial No. 4 on the exposed side and No. 2 on the unexposed side. Unless specified, no material shall be finished lighter than 20 gauge for custom fabricated equipment. All stainless steel shall be stretcher leveled, with a thickness of:
 - 1. 14 Gauge - Not less than 0.075 Inch
 - 2. 16 Gauge - Not less than 0.063 Inch
 - 3. 18 Gauge - Not less than 0.050 Inch
 - 4. 20 Gauge - Not less than 0.038 Inch

- C. Welding shall be of electric arc or oxy-acetylene gas. Welding shall be done with a rod of the same material and full penetration in the entire length of the joint. Welds to be flat without buckles, voids, or imperfections. All welds shall be ground smooth to match the original grain, flush with adjacent surfaces, and conditioned to eliminate dangerous surfaces. Shear cuts or bends that tend to open the surface of the metal shall be rewelded, ground, and polished. Ends and edges which are rough or sharp shall be filed and ground to a safe, smooth finish before delivery to the job site.
- D. When stainless steel sheets have the grain running in different directions, the sheets shall be so jointed, and welds run and finish in such a manner as to make the sheets appear as one continuous product.
- E. Galvanizing shall be applied to rolled shapes in conformance with ASTM A123, coating designation G-90, and to sheets in conformance with ASTM A526, coating designation G-90.
- F. Galvanized steel sheets shall be cold-rolled, stretcher leveled, bonded, and rerolled to ensure a smooth surface.
- G. Castings shall be corrosion-resisting metal-containing, not less than 30% nickel. All castings shall be rough ground, polished, and buffed to a bright luster, and free from pit marks, runs, checks, burrs, and other imperfections. In lieu of corrosion-resisting metal castings, die-stamped or cast 18-8 stainless steel will be acceptable.

2.2 MANUFACTURED ITEMS

- A. Except when specified otherwise under the individual item specifications in the "Schedule of Equipment", all items of standard manufactured equipment furnished shall be complete in accord with the manufacturer's standard specifications for a specific unit of a model called for, including finishes, components, attachments, etc.
- B. Substitutions for manufactured equipment specified will be accorded consideration under terms set forth in "Substitutions-Standards".
- C. Nameplates:
 - 1. Nameplates shall be provided on each "buy-out" product identifying the product manufacturer, model number, serial number, date of manufacture, electrical characteristics, and other identifying information for use in warranties and securing replacement parts.
 - 2. The nameplates may be on the back or bottom of small and portable equipment, but on heavy, permanently installed equipment, the nameplate shall be visible without searching. Electrical equipment shall have plates giving electrical characteristics.
 - 3. Nameplates shall fit snugly against the surface of the equipment, shall be no larger than necessary, shall be free of rough edges, and shall be attached in such a manner that it will not interfere with the sanitation of the equipment.
 - 4. Separate equipment identification plates with the contract number marked thereon shall be securely fastened to the surface of each piece of equipment. The identification plate and information imprinted thereon shall be as permanent as the life expectancy of the equipment to which it is affixed.

2.3 FABRICATED METAL EQUIPMENT

- A. Products fabricated by Atlanta Custom Fabricator, LTI, Eagle Group, and Advance Tabco, modified to comply with specifications, are acceptable.
- B. Metal tops:
1. Metal tops shall be constructed of 14-gauge stainless steel with butt joints welded, ground, and polished smooth, resulting in a one-piece top without joints and crevices. Tops are to be reinforced with 14-gauge stainless steel channel irons, 1-inch by 5-inches by 1-inch. Channel irons shall be securely fastened to the underside, on 30-inch centers, by studs or welding, in a vermin-proof manner. Freestanding ends are to be turned down 1-3/4-inch on bull-nose edge or 2-inch on rolled down the edge, with exposed corners rounded on a 2-1/2-inch radius or bull-nose corner.
 2. Where the table borders or is adjacent to the wall, provide an 8-inch-high backsplash with a 2-inch turn back on a 45-degree angle to the wall unless otherwise specified. Provide welded enclosed ends unless otherwise specified.
 3. Where legs, standards, pipes, or pipe chases pass through a work area or tabletop, they shall pass through 3-inch-high stainless steel sleeves, with the periphery fully welded and polished to match adjacent surfaces.
 4. Sound deadening; minimum 1/8-inch thick shall be applied to the undersides of dish tables and allowed to dry thoroughly before being finished with two (2) coats of epoxy paint.
 5. See drawings for typical details.
- C. Sinks:
1. Sinks shall be constructed of 14-gauge stainless steel sheets with interior corners rounded on a minimum 1/2-inch radius. Bottom corners shall be fully coved.
 2. Sinks to be welded into table tops with joints ground, polished, and made to match adjacent surfaces.
 3. Each pot sink compartment shall have a cut-out on the rear to accommodate the overflow assembly provided with the drain assembly. Overflow and drain assemblies shall be installed and made watertight.
 4. Provide each sink with a 2-inch chromium-plated waste outlet with a stainless steel strainer and chromium-plated tailpiece. Provide with a rotary lever handle waste valve. Wastes are to be depressed in sink bottoms, with bottoms inclining down towards the wastes. Provide pot sinks with overflow assembly.
 - a. Wastes for pot sinks to be T&S Brass Model No. B-3940-01.
 - b. Wastes for prep sinks shall be T&S Brass Model No. B-3940.
 - c. Products manufactured by Component Hardware and Dormont, modified to comply with specifications, are also acceptable.
 5. The rotary handle shall have a front stainless steel bracket or support welded to the underside of the sink compartment.

- D. Drain tables and drain boards shall be constructed of 14-gauge stainless steel, size and shape as specified, and made integral with sinks. Construct drain tables or boards to allow liquids to drain into sinks. The front and free ends are to be constructed with a minimum 3-inch-high by 1-1/2-inch rolled rim on a 180-degree turn unless otherwise specified.
- E. Undershelves and intermediate shelves shall be constructed of 18-gauge stainless steel and notched to fit around legs. Provide 2-inch turn-up at the rear. Shelves shall be fixed in place unless otherwise specified.
- F. Overshelves:
1. Overshelves shall be constructed of 16-gauge stainless steel with edges rolled up or down as specified.
 2. Table-mounted over shelves shall be supported by 16-gauge stainless steel tubular legs. Legs are to be securely fastened to the tabletop with 1-5/8-inch stainless steel supports with plated inside liner. Support to lock in place with a single set screw.
 3. Cantilevered over shelves shall be supported on the table's extended rear legs and 14-gauge stainless steel flag brackets.
 4. Wall-mounted over shelves shall be secured to the wall using stainless steel screws with expansion shields. Brackets shall be spaced at 4-feet on center maximum.
- G. Doors:
1. Hinged doors shall be double pan construction with an 18-gauge stainless steel face and 20-gauge stainless steel rear unless otherwise specified. Doors shall be a maximum of 1-5/8-inch thick and filled with sound-deadening material. Corners shall be welded, ground, and filed smooth.
 2. Provide full width of the door front with an integral horizontal pull.
 3. Mount hinged doors on stainless steel lift-off hinges.
- H. Drawers:
1. Lift out type drawer body to be constructed from a single sheet of 20-gauge stainless steel. Drawer to be 20-inches by 20-inches by 5-inches-deep with coved inside corners unless otherwise specified.
 2. Construct drawer front of double-wall stainless steel with 16-gauge exterior and 20-gauge interior. Provide with integral horizontal pull. Fill void in the drawer front with sound deadening material.
 3. Mount the drawer pan in an 18-gauge stainless steel cradle with roller bearing slides with stops. Enclose the drawer in an 18-gauge stainless steel housing on sides and rear. Design pan carrier to open fully without tilting. When fully extended, drawer shall support a minimum of 200 pounds.
 4. Provide manually operated release latches to allow drawer removal.
 5. Drawer assemblies shall be positive self-closing type.
- I. Legs, braces, gussets, and feet:
1. The height of tables and other fabricated equipment shall be as specified.

2. Legs shall be continuously welded, ground smooth and polished to have a uniform finish. Legs are to be spaced at intervals of 72" maximum on center, braced by a 1-5/8-inch outside diameter 16-gauge stainless steel tube or undershelf welded to the legs 10-inches above the finished floor. Braces shall be constructed to form rectangular or "H" frames, and there shall be at least one (1) brace welded to each leg. Weld around periphery at joint to legs and grind smooth.
 3. Gussets shall be a 3-1/2" inch-high cylindrical leg socket designed to accept legs provided. Body shall be flared out to 2-3/4-inch diameter at the top for easy welding. Provide with a locking set screw to assure secure assembly. Leg gussets are to be welded to the underside of tables, sinks, and reinforcing.
 4. Feet shall be stainless steel adjustable bullet shape, fully enclosed, and fit tightly to the leg. Provide 1-inch up and down adjustment from the central position, at no time exposing any threads. Adjustments are to be easily made by hand without the use of tools.
 5. Legs for cabinet bases shall be 6-inches-high, including feet.
 6. Freestanding sinks shall be supported on legs and feet as specified, with bracing from front to rear only.
 7. Where flanged feet are specified, provide stainless steel 1-5/8-inch diameter adjustable flanged foot inserts with mounting holes which can be securely fastened to the floor.
- J. Casters, where specified, shall be stainless steel swivel plate type. Provide gray 5-inch polyurethane wheels with 1-1/4-inch tread, leakproof Zerk grease fittings and seals, and a 250-pound capacity. Front casters shall be provided with locking brakes.

2.4 FINISHES

- A. Paint and coatings shall be of an NSF-approved type suitable for use in conjunction with foodservice equipment. Such paint or coating shall be durable, non-toxic, non-dusting, non-flaking, and mildew resistant; shall comply with all governing regulations and shall be applied in accordance with the recommendations of the manufacturer.
- B. All exterior, galvanized parts, exposed members of the framework, and wrought steel pipe where specified to be painted shall be cleaned, properly primed with rust-inhibiting primer, degreased, and finished with two (2) coats of epoxy-based grey hammer tone paint, unless otherwise specified.
- C. Stainless steel, where exposed, shall be polished to a #4 commercial finish. Where unexposed, finish shall be #2B. The grain of polishing shall run in the same direction wherever possible. Where surfaces are disturbed by the fabricating process, such surfaces shall be finished to match adjacent undisturbed surfaces.
- D. Fabricated equipment shall be spray-coated with plastic suitable for protecting the equipment during transport and installation. The coating shall be easily removable and shall be removed after the equipment installation is complete at the worksite or, alternately, when directed by the Consultant.

- E. Exposed surfaces on brass, bronze, or steel shall be plated with chromium over nickel in accordance with Federal Specification WW-P-541, Paragraph 9.5 and Table 9.4 unless otherwise specified.

2.5 MISCELLANEOUS ACCESSORIES

- A. Water filters:
 - 1. Provide water filters confirmed to be compatible with the water quality and pressure on-site for all ice-making equipment, hot and cold beverage equipment, dishwashing, and steamer/combi-ovens. All filter units are to be provided with shut-off valves and quick-change filters.
- B. Automatic ignition:
 - 1. All gas-fired equipment shall have automatic ignition. Where required, all gas equipment shall be furnished with a safety pilot and one hundred percent safety cut-off.
- C. Pass-thru enclosures:
 - 1. Provide 20-gauge stainless steel trim to fill in wall openings at pass-thru cabinets. Trim shall overlap the wall by approximately 2-inches and be within 1/2-inch of the cabinets on each side. Provide for a 3-inch opening for air circulation at the top of the cabinet.
- D. Draft beer system:
 - 1. Foodservice Equipment Contractor to provide and install all line sets, fittings, and accessories necessary for a complete long draw draft beer system installation.

2.6 SCHEDULE OF EQUIPMENT

- A. The intent of the prime specification is to set forth the level of quality and features/options that are desired by the Owner. All features and options of the prime specification must be included with products substituted from the listing of approved manufacturers. It is the responsibility of the Foodservice Equipment Contractor to ensure that any products by manufacturers listed as being acceptable to the prime specification meet the design and performance specifications of the prime specification in every way.
- B. Obtain equipment of like families through the same manufacturer.
- C. These documents are for information purposes only and are not 100% CDs.
- D. Refer to the Foodservice Equipment Plans for the location of equipment:
 - 1. ICE MACHINE
 - a. Hoshizaki Model No. KM-520MAJ*CO13
 - b. Provide ice maker model KM-502MAJ manufactured by Hoshizaki as shown on plans and in accordance to the following specifications.
 - c. Ice Maker, Cube-Style, 22"W, air-cooled, self-contained condenser, production capacity up to 556 lb/24 hours at 70°/50° (480 lb AHRI

certified at 90°/70°), stainless steel finish, crescent cube style, R-404A refrigerant, 115v/60/1-ph, 10.6 amps, NSF, UL, ENERGY STAR®

- d. Warranty: 3-Year parts & labor on entire machine.
- e. Warranty: 5-Year parts & labor on evaporator.
- f. Warranty: 5-Year parts on compressor & air-cooled condenser.
- g. H9320-51 Water Filtration System, single configuration, 18.4" H (manifold & cartridge).
- h. Warranty: 1-Year on entire water filtration system & replaceable elements, standard.
- i. Ice storage bin, model number B-500SF
- j. Warranty: 3-Year parts & labor for bin.
- k. HS-2033 Top Kit, 8", ABS.
- l. HS-5607 Scoop Holder Kit.

2. WIRE SHELVING

- a. Metro Model No. 2142BR*CO13 and 2148BR*CO13
- b. Super Erecta® Shelf, wire, 42"W x 21"D, Brite (zinc) finish, plastic split sleeves are included in each carton, NSF.
- c. 86P Super Erecta® SiteSelect™ Post, 86-1/2"H, adjustable leveling bolt, posts are grooved at 1" increments & numbered at 2" increments, double grooved every 8", chrome finish

3. UNDERCOUNTER REFRIGERATOR

- a. True Mfg. - General Foodservice Model No. TUC-27-HC~SPEC3 SPEC SERIES® Undercounter Refrigerator, 33 - 38°F, SPEC Package 3 includes: 16-ga. stainless steel top, (1) heavy-duty stainless steel door, steel handle, door lock standard, (2) PVC coated adjustable wire shelves, electronic temperature control with digital temperature display, stainless steel sides & back, stainless steel interior, 5" castors, R290 Hydrocarbon refrigerant, 1/6 HP, 115v/60/1-ph, 2.0 amps, NEMA 5-15P, cULus, UL EPH Classified, CE, Made in USA, ENERGY STAR Hand Sink, wall mount, 13-1/2" wide x 9-3/4" front-to-back x 6-3/4" deep bowl, 304 stainless steel construction, left & right end splashes, splash mount gooseneck faucet, basket drain, 1/2" NPS water inlet, deep-drawn seamless design-positive drain, inverted "V" edge, NSF
- b. Self-contained refrigeration standard
- c. Warranty - 7 year compressor (self-contained only), please visit www.Truemfg.com for specifics
- d. Warranty - 5 year parts & labor, please visit www.Truemfg.com for specifics
- e. Right Hand, Standard: Unit comes with field reversible hinges & is built with hinging on right side of unit.
- f. Castors, 5" (36" work surface height) standard

4. BACK BAR COOLER

- a. Perlick Corporation Model No. BBS108

- b. Refrigerated Back Bar Cabinet, four-section, 108"W, self-contained refrigeration, 33.5 cu.ft. internal volume, digital thermostat, LED interior lighting, front vented, automatic defrost & condensate evaporator, includes floor drain, stainless steel interior, side mount compressor, 1/4 HP, R290 Hydrocarbon refrigerant, NSF, cULus Mixer Stand, stationary, 24"W x 30"D x 24"H, 16/300 series stainless steel top with 600 lbs. capacity, rolled front edge, stainless steel adjustable undershelf with 150 lbs. capacity, Uni-Lok® gusset system, stainless steel legs with adjustable stainless steel bullet feet, NSF
 - c. 5 yr. compressor warranty, 1 yr. parts & labor warranty
 - d. Standard refrigerator
 - e. Stainless steel top - no tapping holes Condensing unit location: Right
 - f. Condensing unit cover finish: Black vinyl coated
 - g. End finish: Stainless steel, unfinished, both sides, standard
 - h. Door type, first: glass with black vinyl/field laminated door frame
Door hinge location, first: Left
 - i. Door handle, first: full length stainless steel handle, 24" Shelving style, first: (3) flat shelves
 - j. Door type, second: glass with black vinyl/field laminated door frame
Door hinge location, second: Left
 - k. Door handle, second: full length stainless steel handle, 24" Shelving style, second: (3) flat shelves
 - l. Door type, third: glass with black vinyl/field laminated door frame
Door hinge location, third: Right
 - m. Door handle, third: full length stainless steel handle, 24" Shelving style, third: (3) flat shelves
 - n. Door type, fourth: glass with black vinyl/field laminated door frame
Door hinge location, fourth: Right
 - o. Door handle, fourth: full length stainless steel handle, 24" Shelving style, fourth: (3) flat shelves
 - p. Crisp White™ LED
 - q. 57787 Casters (3-3/4"), set of (6)
5. P.O.S.
- a. By owner
6. POS STORAGE CABINET
- a. Perlick Corporation Model No. TSF18POS
 - b. TSF Series POS Cabinet, 18"W, sound-deadened reinforced top, 1-5/8" grommeted hole in cabinet top & each side, 6" x 6" access cutout with edge guard in back panel, 10"H backsplash with 1" return at top, stainless steel construction, stainless steel legs with adjustable stainless steel feet
 - c. POS-DR18L Door, vented with integral handle, left hinged, stainless steel, for TSF18POS (factory installed)
 - d. POS-DRLK Door Lock, for storage cabinets with (1) door (POS)
 - e. POS-ESR End Splash, on right, stainless steel, for TSF18POS & TSF24POS 1 ea 6" Backsplash

7. UNDERBAR DRAINBOARD

- a. TSD Series Underbar Drainboard, 24"W x 24"D, embossed top, 6"H backsplash, 6" rear deck, stainless steel legs with adjustable thermoplastic feet, stainless steel construction, NSF
- b. 6" Backsplash standard

8. UNDERBAR ICE CHEST

- a. Perlick Corporation Model No. TS36IC
- b. TS Series Underbar Ice Bin/Cocktail Unit, modular, 36"W x 18-9/16"D, approximately 85-lb. ice capacity, 6"H backsplash with 1" return at top, ABS plastic top ledge, 10-3/4" deep stainless steel ice bin, stainless steel front & sides, galvanized steel back & bottom, 1/2" NPS male drain, 1-5/8" tubular stainless steel legs with 1" adjustable thermoplastic feet, NSF
- c. 6" Backsplash standard
- d. BW3-36 Underbar Bottle Well with Ice Chest Cover Assembly, 3-bottle capacity, 2-piece stainless steel sliding cover assembly, (3) black polypropylene bottle wells on left (for TS36, TSD36, & TSS36 ice chests)
- e. ICD-TS Ice Bin Divider, for standard ice chest, 15-1/16" x 9-5/8"
- f. CC6 Condiment Tray, 6 plastic cups, stainless steel rack, 18-5/16" long, free standing or is designed to fit back of #BW6-30, BW6-36, BW12-42 ice chest covers
- g. SR-D24A Speed Rail, double, 24" W, stainless steel construction, factory installed
- h. SRLC-D24 Locking Speed Rail Cover, double, 24" W, stainless steel construction, factory installed (cover only)

9. BLENDER STATION W/ SINK

- a. Perlick Corporation Model No. TS12BLW
- b. TS Series Underbar Blender Station, with dump sink, 12"W, 6" backsplash, 9-5/8" wide x 10-5/8" front-to-back x 6" deep, 4" OC splash mount faucet holes, recessed blender shelf with access hole & duplex outlet (not installed), stainless steel construction, stainless steel legs with adjustable thermoplastic feet, NSF
- c. 6" Backsplash standard
- d. 934GN-LF Front Loading Faucet, wall/splash mount, lead free, gooseneck spout, faucet valves includes: built-in check valves to prevent back flow or across flow, (2) 3/8" O.D. x 3/8" O.D. x 18", braided stainless steel supply lines included
- e. 7055-52 Perforated Wet Waste Pan, 2.7 quart capacity, clear plastic, for 12"W & 14"W blender stations (6-3/8" x 10-3/8" x 4" deep)

10. UNDERBAR DRAINBOARD

- a. TSD Series Underbar Drainboard, 24"W x 24"D, embossed top, 6"H backsplash, 6" rear deck, stainless steel legs with adjustable thermoplastic feet, stainless steel construction, NSF

- b. 6" Backsplash standard

11. UNDERBAR 3 COMPARTMENT SINK

- a. Perlick Corporation Model No. TS53C
- b. TS Series Underbar Sink Unit, three compartment, 60"W x 18-9/16"D, 6"H backsplash, 10" wide x 14" front-to-back x 9-1/4" deep compartments, 12" embossed drainboards on left & right, 4" OC splash mount faucet holes, apron on front & sides, sound-deadened underside, includes 1-1/2" drains & 8-1/2" removable overflow standpipes, stainless steel construction, stainless steel legs with adjustable thermoplastic feet, NSF
- c. 6" Backsplash standard
- d. 934-10LF Front Loading Faucet, wall/splash mount, lead free, 10" swing spout, faucet valves include built-in check valves to prevent back flow or cross flow, (2) 3/8" O.D. x 3/8" O.D. x 18" braided stainless steel supply lines included

12. HAND SINK

- a. Perlick Corporation Model No. TS12HSN
- b. TS Series Underbar Hand Sink Unit, free standing, 12"W x 22-1/4"D, 6" backsplash, 10" wide x 14" front-to-back x 9-1/4" deep sink, 4" OC splash mount faucet holes, 16 oz. pump soap dispenser, C-fold paper towel dispenser on front apron, sound-deadened underside, (1) 8- 1/2" standpipe, 1-1/2" NPS male drain, stainless steel construction, stainless steel legs with adjustable thermoplastic feet, NSF
- c. 934GN-LF Front Loading Faucet, wall/splash mount, lead free, gooseneck spout, faucet valves includes: built-in check valves to prevent back flow or across flow, (2) 3/8" O.D. x 3/8" O.D. x 18", braided stainless steel supply lines included.

19. P.O.S.

- a. By owner

20. SELF-CONTAINED BACK BAR 2-DOOR REFRIGERATOR

- a. Perlick Corporation Model No. BBS60
- b. Refrigerated Back Bar Cabinet, two-section, 60"W, self-contained refrigeration, 16 cu.ft. internal volume, digital thermostat, LED interior lighting, front vented, automatic defrost & condensate evaporator, includes floor drain, stainless steel interior, side mount compressor, 1/5 HP, R290 Hydrocarbon refrigerant, NSF, cULus
- c. 120v/60/1-ph, 2.5 amps, NEMA 5-15P
- d. 5 yr. compressor warranty, 1 yr. parts & labor warranty Standard refrigerator
- e. Stainless steel top - no tapping holes Condensing unit location: Left
- f. Condensing unit cover finish: Black vinyl coated
- g. End finish: Stainless steel, unfinished, both sides, standard

- h. Door type, first: glass with black vinyl/field laminated door frame Door hinge location, first: Left
- i. Door handle, first: full length stainless steel handle, 24" Shelving style, first: (3) flat shelves
- j. Door type, second: glass with black vinyl/field laminated door frame Door hinge location, second: Right
- k. Door handle, second: full length stainless steel handle, 24" Shelving style, second: (3) flat shelves
- l. Crisp White™ LED
- m. 57786 Casters, 3-3/4", set of (4)

21. SELF-CONTAINED BACK BAR 2-DOOR REFRIGERATOR

- a. Perlick Corporation Model No. BBS60
- b. Refrigerated Back Bar Cabinet, two-section, 60"W, self-contained refrigeration, 16 cu.ft. internal volume, digital thermostat, LED interior lighting, front vented, automatic defrost & condensate evaporator, includes floor drain, stainless steel interior, side mount compressor, 1/5 HP, R290 Hydrocarbon refrigerant, NSF, cULus
- c. 120v/60/1-ph, 2.5 amps, NEMA 5-15P
- d. 5 yr. compressor warranty, 1 yr. parts & labor warranty Standard refrigerator
- e. Stainless steel top - no tapping holes Condensing unit location: Left
- f. Condensing unit cover finish: Black vinyl coated
- g. End finish: Stainless steel, unfinished, both sides, standard
- h. Door type, first: glass with black vinyl/field laminated door frame Door hinge location, first: Left
- i. Door handle, first: full length stainless steel handle, 24" Shelving style, first: (3) flat shelves
- j. Door type, second: glass with black vinyl/field laminated door frame Door hinge location, second: Right
- k. Door handle, second: full length stainless steel handle, 24" Shelving style, second: (3) flat shelves
- l. Crisp White™ LED
- m. 57786 Casters, 3-3/4", set of (4)

22. UNDERBAR DRAINBOARD

- a. Perlick Corporation Model No. TSD24
- b. TSD Series Underbar Drainboard, 24"W x 24"D, embossed top, 6"H backsplash, 6" rear deck, stainless steel legs with adjustable thermoplastic feet, stainless steel construction, NSF
- c. 6" Backsplash standard

23. UNDERBAR ICE CHEST

- a. Perlick Corporation Model No. TS36IC
- b. TS Series Underbar Ice Bin/Cocktail Unit, modular, 36"W x 18-9/16"D, approximately 85-lb. ice capacity, 6"H backsplash with 1" return at top, ABS plastic top ledge, 10-3/4" deep stainless steel ice bin, stainless steel front & sides, galvanized steel back & bottom, 1/2" NPS male

drain, 1-5/8" tubular stainless steel legs with 1" adjustable thermoplastic feet, NSF

- c. 6" Backsplash standard
- d. BW3-36 Underbar Bottle Well with Ice Chest Cover Assembly, 3-bottle capacity, 2-piece stainless steel sliding cover assembly, (3) black polypropylene bottle wells on left (for TS36, TSD36, & TSS36 ice chests)
- e. ICD-TS Ice Bin Divider, for standard ice chest, 15-1/16" x 9-5/8"
- f. CC5 Condiment Tray, 5 plastic cups, stainless steel rack, 15-3/8" long, free standing or is designed to fit back of #BW3-24 ice chest covers
- g. SR-D36A Speed Rail, double, 36" W, stainless steel construction, factory installed
- h. SRLC-D36 Locking Speed Rail Cover, double, 36" W, stainless steel construction, factory installed (cover only)

24. BLENDER STATION W/ SINK

- a. Perlick Corporation Model No. TS12BLW
- b. TS Series Underbar Blender Station, with dump sink, 12"W, 6" backsplash, 9-5/8" wide x 10-5/8" front-to-back x 6" deep, 4" OC splash mount faucet holes, recessed blender shelf with access hole & duplex outlet (not installed), stainless steel construction, stainless steel legs with adjustable thermoplastic feet, NSF
- c. 6" Backsplash standard
- d. 934GN-LF Front Loading Faucet, wall/splash mount, lead free, gooseneck spout, faucet valves includes: built-in check valves to prevent back flow or across flow, (2) 3/8" O.D. x 3/8" O.D. x 18", braided stainless steel supply lines included
- e. 7055-52 Perforated Wet Waste Pan, 2.7 quart capacity, clear plastic, for 12"W & 14"W blender stations (6-3/8" x 10-3/8" x 4" deep)

25. HAND SINK

- a. Perlick Corporation Model No. TS12HSN
- b. TS Series Underbar Hand Sink Unit, free standing, 12"W x 22-1/4"D, 6" backsplash, 10" wide x 14" front-to-back x 9-1/4" deep sink, 4" OC splash mount faucet holes, 16 oz. pump soap dispenser, C-fold paper towel dispenser on front apron, sound-deadened underside, (1) 8- 1/2" standpipe, 1-1/2" NPS male drain, stainless steel construction, stainless steel legs with adjustable thermoplastic feet, NSF
- c. 934GN-LF Front Loading Faucet, wall/splash mount, lead free, gooseneck spout, faucet valves includes: built-in check valves to prevent back flow or across flow, (2) 3/8" O.D. x 3/8" O.D. x 18", braided stainless steel supply lines included

26. UNDERBAR 3 COMPARTMENT SINK

- a. Perlick Corporation Model No. TS53C
- b. TS Series Underbar Sink Unit, three compartment, 60"W x 18-9/16"D, 6"H backsplash, 10" wide x 14" front-to-back x 9-1/4" deep compartments, 12" embossed drainboards on left & right, 4" OC splash mount faucet holes, apron on front & sides, sound-deadened underside,

includes 1-1/2" drains & 8-1/2" removable overflow standpipes, stainless steel construction, stainless steel legs with adjustable thermoplastic feet, NSF

- c. 6" Backsplash standard
- d. 934-10LF Front Loading Faucet, wall/splash mount, lead free, 10" swing spout, faucet valves include built-in check valves to prevent back flow or cross flow, (2) 3/8" O.D. x 3/8" O.D. x 18" braided stainless steel supply lines included

PART 3 - EXECUTION

3.1 DEMONSTRATION AND INSTRUCTION MANUALS

- A. At a time as designated by the Architect or Owners, demonstrate the operation, care, and minor maintenance of the equipment supplied. Supply the Architect with an affidavit signed by the Owners or Food Service Manager/Director that this service was rendered and performed.
- B. At the start of the operation, devote one full working day monitoring all equipment operation. The purpose of this day is to ensure equipment is in proper working order at the start.
- C. Coordinate start-up of equipment with testing and balancing of HVAC system. Ensure that the HVAC will be operating correctly, even during maximum equipment use.
- D. Submit copies before final punch list. Submit to Owners at time of demonstrations two digital copies (flash drive, CD, or alternate digital device) containing:
 - 1. Instructions.
 - 2. Warranties.
 - 3. Parts list of all bought out items provided under this Section.
 - 4. List of names, addresses, and telephone numbers of local authorized servicing agencies.
 - 5. The videos are to show and detail the proper care and maintenance of equipment.

3.2 FIELD MEASUREMENTS

- A. Field measurements shall be made, giving due consideration to any Architectural, Mechanical, or Structural discrepancies which may occur during the construction of the building. No extra compensation shall be allowed for any difference between actual dimensions secured at the job site and the measurements indicated on the Contract Drawings.
- B. Any differences that may be found during field measurements shall be submitted to the Architect for consideration before proceeding with the fabrication or supplying of any equipment.

3.3 INSTALLATION

- A. Dispose of all packaging and debris per Construction Waste Management Plan.
- B. Make arrangements for receiving equipment and make delivery into the building. Do not consign any equipment to the Owners or any other Contractor unless written acceptance from them and satisfactory arrangements have been made for the payment of freight and all handling charges.
- C. Deliver all equipment into the building, uncrate, assemble, level and repair any damaged or abraded surfaces. Set equipment temporarily in its final locations, permitting the mechanical and electrical trades to take the necessary measures for the connection of the service lines; then move the equipment sufficiently to allow the installation of such service lines. After which realign equipment level and plumb, making the final erection as shown on the Contract Drawings. All equipment shall be installed so as to eliminate objectionable vibration.
- D. The Contractor shall have a competent Food Service Equipment foreman on the premises to assist in furnishing information and supervising the installation of Food Service Equipment under this Section. This foreman shall verify the correct locations for Rough-Ins.

3.4 LUBRICATION - OIL AND GREASE

- A. Each moving part in the entire food facilities installation shall be provided with suitable bearings with provision for greasing, or with grease gun connections suited to a high-pressure gun for distributing heavy oil or light grease. Points of lubrication shall be readily accessible.

END OF SECTION

SECTION 11 81 24
WINDOW WASHING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes, but is not limited to, design and furnishing portable davits, davit sleeves, and davit bases, including fasteners and appurtenances as required or necessary for complete installation.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Davit bases, anchor bolts and lifeline tie-backs.
- C. Related sections include the following:
 - 1. Division-03 Section "Cast-In-Place Concrete" for coordination of imbedded items.
 - 2. Section 05 50 00 "Metal Fabrications," Setting of davit bases.
 - 3. Division 23 - Plumbing: Water supply and faucets on roof.
 - 4. Division 26 - Electrical: Power supply and outlets on roof.

1.2 REFERENCES

- A. Publications listed herein are part of this specification to extent referenced.
 - 1. American Institute of Steel Construction (AISC)
 - a. AISC Publication Load and Resistance Factor Design for Structural Steel Buildings
 - b. AISC Specifications for the Design of Cold-Formed Steel Structural Members
 - 2. American Society for Testing and Materials (ASTM)
 - a. ASTM A36 Specification for Structural Steel
 - b. ASTM A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Hardware
 - c. ASTM A500 Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
 - d. ASTM A780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
 - e. ASTM B209-04 Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 - f. ASTM B221-02 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Wire, Shapes, and Tubes
 - g. ASTM B308/B308M-02 Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles
 - 3. American Welding Society (AWS)
 - a. AWS D1.1 Structural Welding Code

4. Occupational Safety and Health Standards
 - a. ANSI/IWCA I-14.1-2001 Window Cleaning Safety
 - b. 1910 Subpart D (Walking and Working Surfaces)
 - c. 1910.66 Appendix C (Personal Fall Arrest)
 - d. 1910.66 Subpart F (Powered Platforms)
 - e. OSHA procedures and precautions for employees using descent control equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: Include major equipment items.
- B. Shop Drawings: Stamp shop drawings with seal and signature of professional engineer responsible for design.
 1. Submit plans, sections, elevations and details showing sizes, arrangements, materials, thicknesses, finishes, dimensions and other data to clearly explain character and nature of proposed equipment.
 2. Include location diagrams for inserts, davits, outriggers, quick release stabilizer anchors, and other items to be built into structure.
 3. Submit sequence drawings to illustrate cleaning of all exterior surfaces of building facade from platform; show intended operations can be accomplished in safe and unencumbered manner in conformance with codes and regulations having jurisdiction.
 4. Provide large scale roof plans and elevations showing equipment in various positions at various launch points to ensure that clearances and space restrictions have been considered and accommodated. Show special details to allow placement of platforms at each washing position.
 5. Verify Project conditions affecting work of this Section and obtain accurate measurements for incorporation into shop drawings.
- C. Submit changed condition drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Informational Submittals: Submit following packaged separately from other submittals:
 1. Qualification Data: Manufacturer's installer's qualification data.
 2. Manufacturer's instructions.

1.5 CLOSEOUT SUBMITTALS

- A. Closeout Submittals: Submit maintenance data in accordance with Section 01 78 23.
 1. Include step-by-step operating procedure directions, parts list, equipment checklist, schematic wiring diagrams, and procedure to be followed during emergency operations.
 2. Provide maintenance checklist broken down on weekly, monthly and yearly basis, describing procedures to be followed, time intervals, and materials to

be used. Include names, addresses, and telephone numbers of service firms in vicinity of building available to respond within 24 hours of service call.

1.6 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide window washing components and systems from same manufacturer or approved by manufacturer.
- B. Manufacturer's Qualifications: Firm solely involved in design, manufacture, and installation of power operated window washing units, that has been actively engaged in this business for not less than 10 years.
 - 1. Submit evidence when requested, indicating that firm has successfully installed window washing supports of similar type as proposed for use on this Project. Include one installation not less than five years old.
 - 2. Submit with proposal, concept drawing which demonstrates manufacturer's proposed solution to building requirements showing aspects that may deviate from Drawings and Specifications. Show coordination with building structure, locations, layout, plumbing requirements, electrical requirements, and loads imposed on building structure along with description of proposed system operation.
- C. Installer Qualifications: Installer employed by manufacturer or approved in writing by manufacturer.
- D. Welder Qualifications: AWS certified within past 12 months for each type of weld required.
- E. Regulatory Requirements:
 - 1. Comply with federal, state and local codes, ordinances, and requirements pertaining to work of this Section.
 - 2. Where requirements of governing codes, regulations, laws and rules conflict with these Specifications and are mandatory, comply with regulatory requirements.

1.7 PRE-INSTALLATION CONFERENCE

- A. Conduct pre-installation conference in accordance with Section 01 31 00.
 - 1. Plan necessary coordination with structural, curtain wall, roofing, plumbing, and electrical trades.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 01 61 00.
 - 1. Shop fabricate window washing equipment in sizes as large as practical. Deliver to Project properly packaged and crated to prevent damage during transit and handling.
 - 2. Store materials under cover in dry, clean location, off ground. Remove materials which are damaged or otherwise not suitable for installation from Project and replace with acceptable materials.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Anchorage Design Requirements

1. Safety anchor system design shall comply with current OSHA, ANSI, and local regulations pertaining to window cleaning and fall protection in accordance with sections 1.1, 1.2, and 1.3.
2. Anchor system shall provide independent fall arrest anchorages in addition to suspension line anchorages for each descent location as required by OSHA and ANSI requirements.
3. Structural design requirements of anchorages and tie-back
 - a. Anchorage shall be capable of sustaining a minimum ultimate load of 5,000 lbs., in any direction the load may be applied, without fracture or failure.
 - b. Anchorage shall be capable of sustaining a minimum proof load of 2,500 lbs., in any direction the load may be applied, without permanent deformation or damage to anchorage.
 - c. Anchorages shall be designed with a minimum 1,250 lb. working load, in any direction the load may be applied.
 - d. Parapet or guardrails subject to direct loading by workers' ropes, possibly cables, shall be designed to withstand such loading (typically 1,800 lbs) without damage to either the structure of the rigging component in contact with it.
4. Locate primary support and fall arrest anchors in conjunction with areas on façade of building needing to be serviced. Consideration shall be given to the type of suspension equipment that will be used at the building and conditions such as workers' reach, rigging methods, and roof edge conditions. Anchorages shall be unobstructed and located behind and in line with equipment or portion of building they are intended to service.

B. Rigging Sleeve and Davit Design Requirements

1. Locate rigging sleeves and davits to accommodate suspended maintenance during swing stage operations. Typically, spacing of davits is on column lines or every 20 feet, on center. Typical spacing of rigging sleeves is 6 foot 8 inches, on center. Placement of supports should allow cables suspending powered equipment to hang either parallel and in plane or slightly angulated with the building façade as required by users.
2. Locate independent anchorages for personal fall protection when using rigging sleeves or davits.
3. Davits shall be capable of supporting an ultimate load of not less than 4 times the rated load. The rated load of the davit shall be based on the swing stage hoist and powered platform load capacity, which is frequently 1,000 lbs or more.

2.2 ACCEPTABLE MANUFACTURERS / INSTALLERS

- #### A. Manufacturers / Installers: Subject to compliance with requirements, provide one of the following:

1. Pro-Bel Group.
2. Rooftop Anchors, Inc.
3. Sky Rider Equipment Co., Inc.
4. Summit Anchor Company.

2.3 MATERIALS

A. Metals:

1. Aluminum Alloy: Alloy 6061-T6, Schedule 80, designed in accordance with ANSI A120.1
2. Steel Pipe: ASTM A53, Type E or S, Grade B.
3. Structural Steel Shapes, Bars and Plates: ASTM A36.
4. Steel Tubing: ASTM A519.
5. Stainless Steel Components: UNS S30400.

B. Connectors: Galvanized steel anchor bolts, ASTM A307 or A325.

1. Fasteners Exposed to Weather and Carrying Calculated Stress: Galvanized or stainless steel.

C. Non-Shrink Grout: Non-shrink, non-ferrous, equivalent to Masterflow 713 by Master Builders, Cleveland, OH.

2.4 MANUFACTURED UNITS

A. Anchors:

1. Capable of withstanding 5000 lbs. (2268kg) in any direction without permanent deflection.
2. Anchor eye size: Not less than $\frac{3}{4}$ inch (20 mm) diameter material with 2 $\frac{1}{4}$ in (60 mm) eye opening.
3. Anchor eye metals:
 - a. Forged, 1030 quenched and tempered per ASTM 576-90-b, 72ksi minimum
 - b. Stainless steel, type 304, solution annealed, 35 ksi minimum
4. Anchor tube height: not less than 4 in. above the finished roof.

B. Davit Socket Bases: Permanently attached to structure at locations indicated in accordance with Drawings and manufacturer's recommendations.

1. Stanchion type complete with davit adapter and lock pin with stainless steel safety snap pin.
2. Davit socket; with two stainless steel hinge pins and stainless steel safety snap pins.
3. Pier Height: not less than 10 in. above finished roof surface to allow proper fit up with adaptor.

C. Rigging Sleeves

1. Assembled complete with cap tethered to cross bar.
 2. Length as required to clear under side of façade by two inches.
 3. Not less than 6" above the finished roof.
- D. Safety Tie-Backs: Position directly behind each davit base and at right angles to building face or integral with permanently supported socket base.
1. Where right angle spacing cannot be achieved, furnish two safety tie-backs for each davit location.
 2. Hot dip galvanize safety tie-backs after fabrication.
- 2.5 FABRICATION
- A. Fabricate work true to dimension, square, plumb, level, and free from distortion or defects detrimental to appearance and performance.
 - B. Grind off surplus welding material to ensure exposed surfaces are smooth so as not to abrade workers' ropes.
 - C. Welding shall be in accordance with the AWS Structural Welding Code D1.1/D1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General Requirements
 1. Install window washing system in compliance with manufacturer's instructions. Install equipment level, tightly fitted, and flush to adjacent surfaces as needed for proper installation.
 2. Coordinate anchor installation with roofing installation to ensure a watertight and warrantable condition of the roofing. Anchors shall be directly flashed into roofing in a manner compatible with roofing system and anchors.
 3. When components come into contact with dissimilar metals, surfaces shall be kept from direct contact to prevent corrosion.
 4. No wall anchors shall be installed through membrane roofing system without specification detailing such from the architect or water proofing company warranting the roof.
 5. Deform a minimum of two threads of tail end of anchor studs after nuts have been tightened to prevent accidental removal or vandalism. Deform threads with 2/32" stainless steel punch
- B. Instructions for welding access equipment to structure:

1. All welders must be certified to American Welding Society (AWS) in accordance with AWS standards.
2. Welding rods used to weld the anchor system to be E70 xx electrodes.
3. Prior to welding anchors to structure, abrasively remove within one inch of all welded surfaces galvanizing, mill, scale, and rust.
4. Immediately after welding, chip away slag to prepare for welding inspector to inspect welds.
5. An AWS certified welding inspector must inspect and confirm size of all field welds. Following the inspection, a written report must be supplied to the building owner and/or general contractor. Welded joints shall not be painted until after welding has been completed and the weld accepted.
6. Immediately after an acceptable inspection, paint welded areas with cold-galvanizing compound to protect from corrosion.
7. Structural steel to receive roof or wall anchors shall have a surface wide enough so that base plate can be welded all the way around. For example, anchors equipped with 4½ in. base plates would require a minimum 5 in. surface to weld to.

3.3 FIELD QUALITY CONTROL

A. Inspection and site visits

1. Inspections and site visits shall be performed while installation of equipment is in progress under the supervision qualified professional engineer registered in the jurisdiction where the project is located.
2. On-site inspection of equipment welded to structure shall be performed by an AWS Certified Welding Inspector verifying, in writing, size and quality of welds. Such an inspection shall be performed on each piece of equipment before roofing material is installed.
3. On-site inspection shall be performed on all cast in place items while being tied in with the rebar with sufficient time before concrete is poured to allow to adjustments to embedded items as recommended by inspector.
4. Contractor shall be responsible to schedule above site visits and inspections with sufficient advanced notice given to the inspection company.

B. Site Tests

1. All equipment shall be tested on site in accordance with manufacturer's recommendations, under the supervision of a professional engineer, and ANSI/IWCA I-14.1-2001 Window Cleaning Safety Standards, before being placed in service.
2. Equipment shall be tested under the supervision of a professional engineer with experience with suspended maintenance equipment and manufacturers guidelines.

C. Manufacturer shall assist and/or supervise installation of window washing equipment installed by others when such is included in contracted.

3.4 ADJUSTING

- A. Verify that completed work has been installed correctly and products function properly. Adjust where needed to ensure satisfactory operation.
- B. Complete inspection logbook to certify system for use noting any deviations, changes, or corrections from original shop drawings. Provide as-built anchor layout plan on 11 in. x 17 in. paper or larger together with annual inspection logbook.

3.5 CLEANING

- A. At the end of each workday, remove unused materials, debris, and containers from the site.
- B. Upon completion of the Work, remove unused materials, debris, containers, and equipment from the project site. In addition to the initial cleaning procedure required, and not more than two days before occupancy by the Owner, clean the Work as recommended by the manufacturer.

END OF SECTION

SECTION 12 22 00
CURTAINS AND DRAPES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Drapes.
 - 2. Drapery tracks.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Drapery Tracks: Include maximum weights of drapes that can be supported.
 - 2. Fabrics.
 - 3. Textile treatments.
- B. Shop Drawings:
 - 1. Drapery Tracks: Show installation and anchorage details and locations of controls.
 - 2. Drapes: Show sizes, locations, and details of installation.
- C. Samples for Initial Selection: For each type of product indicated.
- D. Samples for Verification: As follows:
 - 1. Drapery Fabrics: For each color and pattern indicated, full width by 36 inches long, from dye lot to be used for the Work and with specified textile treatments applied. Show complete pattern repeat if any. Mark top and face of fabric.
 - 2. Textile Trims: For each color and pattern indicated, 18 inches long.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For drapery track installation; reflected ceiling plans drawn to scale and coordinating track installation with openings and ceiling-mounted items, on which the following items are shown:
 - 1. Suspended ceiling components.
- B. Product Certificates: For each drapery fabric treated with flame retardant, signed by fabric supplier and indicating treatment durability and cleaning procedures required to maintain treatment effectiveness.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For products installed to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Drapery Track Carriers: For each size indicated, equal to 5 percent of amount installed, but no fewer than 10 of each size.
 - 2. Drapery Track Controls: For each type indicated, equal to 5 percent of amount installed, but no fewer than 10 of each type.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: For drapes and drapery tracks, fabricator of drapes.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before drape fabrication, and indicate measurements on Shop Drawings.
- B. Scheduling: Do not deliver or install drapes until after other finish work, including painting, is complete and spaces are otherwise ready for occupancy.

PART 2 - PRODUCTS

- A. Manually Operated Track:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Forest Group USA, Inc.
 - b. Kirsch.
 - c. Silent Gliss USA Inc.
 - d. Springs Window Fashions.
 - 2. Construction: Extruded aluminum, slotted for mounting at interval of not more than 24 inches o.c.
 - a. Lengths and Configurations: As indicated on Drawings.
 - b. Support Capability: Weight of drape indicated mounted on track length indicated.
 - c. Finish: Manufacturer's standard black.
 - 3. Mounting Brackets: Aluminum, of type suitable for fastening track to surface indicated and designed to support weight of track assembly and drape plus force applied to operate track.
 - a. Mounting Surface: Wall and Ceiling.
 - 4. Installation Fasteners: Sized to support track assembly and drape, and fabricated from metal compatible with track, brackets, and supporting construction. Provide two fasteners to fasten each bracket to supporting construction.
 - 5. Operation: Baton.
 - a. Draw: One way, stack as indicated on Drawings.
 - b. Operating Hardware Location: On stack side.
 - 6. Carriers: Ripplefold wheeled carriers to provide fullness indicated.

- a. Master Carriers: Butt.
- 7. End Stops: Manufacturer's standard with track end cap.

2.2 DRP, DRAPERY MATERIALS AND COMPONENTS

- A. Face Fabric: Refer to Interior Finish Schedule on Drawings.
- B. Standard Liner Fabric:
 - 1. Lining Not Included (Un-lined)
- C. Blackout Liner Fabric:
 - 1. Lining Not Included (Un-lined)
- D. Fabric Treatment:
 - 1. Stain Repellent: Scotch guard upholstery soil repellent or other type as recommended by fabric manufacturer. Stain repellent shall be compatible with fire retardant treatment.
 - 2. Fire Retardant Treatment: Type as recommended by fabric manufacturer that will not be detrimental to material color, texture, or feel.
- E. Ripplefold Snap Tape: Kirsch Number 92145 stiffened nylon tape with chrome plated brass snaps on 4-1/4 inch centers.
- F. Hem Weights:
 - 1. Continuous 1/4" Beaded Chain Weight at Bottom Hem.
 - 2. Fabric covered 3/4" nylon corner weights.
- G. Thread: Mercerized cotton, cotton/polyester or polyester fiber compatible with fabric fiber. Match fabric color.

2.3 DRAPE FABRICATION

- A. Prior to fabrication, field measure actual existing conditions to ensure proper fit.
- B. Factory apply fire retardant treatment for drapery materials that do not inherently meet specified flame spread/smoke density requirements.
- C. Fabricate drapes in conventional Ripplefold method.
 - 1. As necessary/required lay out fabric to match continuously printed image at vertical seams so that finished panels are identical and interchangeable.
 - 2. Join vertical seams and serge, trim, and overlock stitch with even seams, free of puckering. Locate seams in inconspicuous areas between fabric folds.
 - 3. Use full width fabric with no more than one single half width section per panel.
 - 4. Hem sides to 1-1/2 inch wide, double turned, triple thickness and blind stitch.
 - 5. Hem tops to 2 inch wide, double turned, triple thickness.
 - 6. Stitch snap tape to heading in accordance with manufacturer's instructions.
 - 7. Hem bottoms to 1/2 inch wide, single turned, double thickness. Blind stitch with hem weights at seams and sides.

8. Fabricate drapes to provide minimum 60 percent (160 pinch pleat) fullness.
9. Provide hobbling thread in the bottom hem of malimo weave and polyester fabric drapes. Leave end pleats free.
10. Provide 1/2 inch gap at finish floor.

PART 3 - EXECUTION

3.1 DRAPERY TRACK 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.

3.2 DRAPE INSTALLATION

- A. Where drapes abut overhead construction, hang drapes so that clearance between headings and overhead construction is 1/4 inch.
- B. Where drapes extend to floor, install so that bottom hems clear finished floor by not more than 1 inch and not less than 1/2 inch.
- C. Where drapes extend to windowsill, install so that bottom hems hang above sill line and clear sill line by not more than 1/2 inch.

3.3 ADJUSTING

- A. After hanging drapes, test and adjust each drapery track to produce unencumbered, smooth operation.
- B. Steam and dress down drapes as required to produce crease- and wrinkle-free installation.
- C. Remove and replace drapes that are stained or soiled.

END OF SECTION

SECTION 12 24 13
ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
2. Section 07 92 00 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified, 10 inches long.

D. Product Schedule: For roller shades. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material.

C. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: MechoShade Systems, Inc.; Mecho /5 or comparable product by one of the following:
1. DFB Sales Inc.
 2. Draper Inc.
 3. Hunter Douglas Contract.
 4. Insolroll Window Shading Systems.
 5. Lutron Electronics Co., Inc.
 6. OEM Shades Inc.
 7. Silent Gliss Inc.
- B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
1. Bead Chains: Manufacturer's standard.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.

- c. Chain-Retainer Type: Clip, jamb mount.
 2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.
 - a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criterion is more stringent.
 - B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 1. Roller Drive-End Location: Right side of interior face of shade.
 2. Direction of Shadeband Roll: Regular, from back (exterior face) 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.
 - D. Shadebands:
 1. Shadeband Material: Light-filtering fabric.
 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
 - b. Color and Finish: As indicated in Interior Finish Legend on Drawings.
 - E. Installation Accessories:
 1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
 - a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 6 inches.
 - b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
 2. Endcap Covers: To cover exposed endcaps.
 3. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
 - a. Closure-Panel Width: 2 inches.
 4. Installation Accessories Color and Finish: As selected from manufacturer's full range.
- 2.3 SHADEBAND MATERIALS
- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller shade manufacturer.
2. Type / Weave / Openness Factor: As indicated in Interior Finish Legend on Drawings.
3. Orientation on Shadeband: Up the bolt unless otherwise indicated on Drawings.
4. Color: As indicated in Interior Finish Legend on Drawings.

2.4 ROLLER SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:
 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
- B. Roller Shade Locations: As indicated on Drawings.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

SECTION 12 36 61.19

QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Quartz agglomerate countertops.
 - 2. Quartz agglomerate backsplashes.
 - 3. Quartz agglomerate end splashes.
- B. Related Requirements:
 - 1. Division 22 for sinks and plumbing fittings.

1.2 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- C. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches square.
 - 2. Wood trim, 8 inches long.
 - 3. One full-size quartz agglomerate countertop, with front edge and backsplash, 8 by 10 inches, of construction and in configuration specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For quartz agglomerate countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of countertops.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 QZ, QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

- A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cambria.
 - b. Cosentino USA.
 - c. E. I. du Pont de Nemours and Company.
 - d. LG Chemical, Ltd.
 - e. Meganite Inc.
 - f. Samsung Chemical USA, Inc.
 - g. Technistone USA, Inc.
 - h. Transolid, Inc.
 - 2. Colors and Patterns: As Indicated in Finish Schedule.
- B. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
- C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Premium.
- B. Countertops: 1/2-inch-thick, quartz agglomerate with front edge built up with same material.
- C. Backsplashes: 1/2-inch-thick.
- D. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate with loose backsplashes for field assembly.

- E. Joints: Fabricate countertops in sections for joining in field.
 - 1. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.
 - 2. Joint Type: Bonded, 1/32 inch or less in width.
- F. Cutouts and Holes:
 - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
 - 2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 - 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by quartz agglomerate manufacturer.
 - 1. Adhesives shall have a VOC content of 70 g/L or less.
- B. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do
- B. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- D. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- E. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- F. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION

SECTION 12 48 13

ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient-tile entrance mats.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mats and frames.
- B. Shop Drawings:
 - 1. Divisions between mat sections.
- C. Samples: For the following products, in manufacturer's standard sizes:
 - 1. Floor Mat: Assembled sections of floor mat.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For floor mats and frames to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Resilient-Tile Entrance Mats: Full-size tile units equal to 2 percent of amount installed, but no fewer than 10 units.

PART 2 - PRODUCTS

2.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

- A. Accessibility Standard: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 WM, RESILIENT-TILE ENTRANCE MATS

- 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. Amarco Products.

2. Cactus Mat Mfg. Co.
 3. Consolidated Plastics Company, Inc.
 4. Durable Corporation.
 5. Entrance Inc.
 6. Matco International.
 7. Mats Inc.
 8. Musson Rubber Company.
 9. Pawling Corporation; Architectural Products Division.
 10. Shaw Contract.
- B. Carpet-Type Tiles: Nylon carpet bonded to 1/8- to 1/4-inch- thick, flexible PVC-free backing to form mats 0.50-inches thick with nonraveling edges.
1. Colors, Textures, and Patterns: As selected by Architect from full range of industry colors.
 2. Tile Size: As indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, sizes, and other conditions affecting installation of floor mats and frames.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install surface-type units to comply with manufacturer's written instructions, coordinate with entrance locations and traffic patterns.
 1. Anchor fixed surface-type frame members to floor with devices spaced as recommended by manufacturer.

3.3 PROTECTION

- A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in 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 48 53

RUGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Custom Rugs, loose laid.

1.2 ACTION SUBMITTALS

- A. Shop Drawings:
 - 1. Diagram of types, colors, patterns, direction of yarn and locations of seams. Include dimensions of areas and locate pattern areas.
 - 2. Show locations of items which are to be coordinated with or located within the rugs.

1.3 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Literature: Materials description and installation instructions for materials of the installation.
- B. Warranty: Signed copies of each warranty.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Provide rug material meeting the following:
 - 1. Flame Spread: ASTM E 84, 75 or less.
 - 2. Radiant Panel Test: ASTM E 648, .45 watts/cm² or more.
 - 3. Smoke Density Test: ASTM E 662, 450 or less.
 - 4. Pass Pill Test, DOC FF-1-70.
 - 5. Meet local city code and fire marshal's requirements.
- C. Comply with applicable portions of the Carpet and Rug Institute (CRI), CRI 104, Standard for Installation of Commercial Carpet.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver rugs in original mill protective covering with mill register numbers and tags attached.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install rugs until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- B. Do not install rugs over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by rug manufacturer.

1.7 WARRANTIES

- A. General Warranty: Special warranty specified in this Article is not to deprive Owner of other rights Owner may have under other provisions of the Contract Documents and is in addition to, and is to run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Rug Warranty: Written warranty, signed by rug manufacturer agreeing to replace rug that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of rug due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
 - 1. Provide 10 years from date of Substantial Completion.
- C. Rug Pad Warranty: Written warranty, signed by rug pad manufacturer agreeing to replace rug pad that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of rug pad due to unusual traffic, failure of substrate, vandalism, or abuse. Failure includes, but is not limited to, permanent indentation or compression.
 - 1. Provide 10 years from date of Substantial Completion.
- D. Provide warranties signed by the Contractor, Installing Subcontractor and Rug and/ or Pad Manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. CPT-02, Rugs: Rug types, patterns, colors, products and manufacturers are indicated on the Finish Schedule.
- B. Padding: Densified polyurethane foam cushion as recommended by or other as standard with the rug manufacturer.
- C. Padding Tape: Single faced cloth tape 2 inches wide as recommended by padding manufacturer.
- D. Padding Adhesive: Type recommended by rug and padding manufacturer for seam sealing and adhering rug to padding and padding to subfloor complying with flammability requirements.

- E. Tackless Strips: Water-resistant plywood tackless strip with 2 rows of pins, thickness of strips to match padding thickness. Provide pin length appropriate for each type of rug in the installation.
- F. Latex Leveling Compound: As recommended by the rug and padding manufacturers.
- G. Edge Strips: Solid stainless steel of type shown on the Drawings, "Rondec" (Schluter Systems).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting rug performance.
- B. Examine rug for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 03 30 00 CAST-IN-PLACE CONCRETE and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard" and with rug manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive, rug, and rug cushion manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing rug.

3.3 INSTALLATION – GENERAL

- A. Install rug in accordance with the final reviewed shop drawings and manufacturer's printed instructions and recommendations.
- B. Install rug around floor outlets or similar obstructions. Electrical or mechanical plates where used are to rest on the top surface of the rug.
- C. Report obstructions which may occur to the Architect prior to any work or fabrication.

- D. After the installer knows roll sizes and prior to installation, inform the Architect in writing of any seaming which is subject to change from what is shown on the reviewed shop drawings. Such changes must receive the written approval of the Architect prior to installation.
- E. Clean subfloor surfaces of curing compounds, sealers, hardeners, grease, wax, oil or dirt which impair bonding of adhesives.
- F. Do not install rug and related materials where there is excessive moisture present, nor when temperatures are less than 50 deg F.
- G. Install edge and transition strips at rug terminations and flooring material changes.

3.4 PROTECTION AND CLEANING

- A. Perform the following operations immediately after installing rug:
 - 1. Remove adhesive, seam sealer, and other surface blemishes using cleaner recommended by rug manufacturer.
 - 2. Remove yarns that protrude from rug surface.
 - 3. Vacuum rug using commercial machine with face beater element.
- B. Protect installed rug to comply with CRI 104, Section 15, "Protection of Indoor Installations."
- C. Protect rug against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by rug manufacturer.
- D. Replace damaged rug.
- E. At the completion of the Work when directed by the Owner, remove covering and vacuum clean and remove any soiling to the satisfaction of the Owner.
- F. Remove rubbish, wrapping paper and salvages from the project site.

END OF SECTION

SECTION 12 64 16
BANQUETTE SEATING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Banquette seating in selected areas of the Project.
2. Seat covering upholstery fabric.
3. Field-verifying all measurements and conditions of installation prior to fabrication. Field cutting of banquettes will not be permitted.

B. Related Requirements:

1. Section 06 10 53 - Miscellaneous Carpentry for framing and blocking materials.

1.2 ACTION SUBMITTALS

A. Product Data: samples of fabric; one cushion; a 12" long sample of seam; finish carpentry. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for banquettes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Layout: Show locations of banquettes and adjacent construction, including utility clearances.
2. Show locations of seams.
3. Show details of connection to adjacent construction. Structural connections shall be designed by a structural engineer licensed in the jurisdiction where the project is located.

C. Samples for Verification: For each type of exposed finish required

1. Wood and Plywood Materials and Finishes: Minimum 12" x 12", showing at least one finished edge.
2. Upholstery Fabric: Full width by 36-inch- long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of flame-retardant treatment of fabric, from manufacturer.

B. Maintenance Data: For banquettes. Include the following:

1. Methods for maintaining upholstery fabric.

2. Precautions for cleaning materials and methods that could be detrimental to seating finishes and performance.

C. Warranty: Sample of warranty for fabric finishes.

1. Workmanship: The work of this section shall be subject to a two year warranty against fading, sagging of upholstery, visible indentation of cushions (inability of cushions to rebound from load); and stretching of fabric.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of seating required, including accessories and mounting components, from single source from single manufacturer.

1. Upholstery Fabric: Obtain fabric of a single dye lot for each color and pattern of fabric required.

B. Fire-Test-Response Characteristics of Upholstered Benches:

1. Fabric: Class 1 according to DOC CS 191 and 16 CFR 1610.61, tested according to California Technical Bulletin 117.
2. Padding: Comply with California Technical Bulletin 117.
3. Full-Scale Fire Test: Comply with California Technical Bulletin 133.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install banquettes until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary or permanent HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of layout and construction contiguous with seating by field measurements before fabrication.

1.6 WARRANTY

A. Special Warranty: For fabric flameproofing and fade resistance.

1. Failures include, but are not limited to, the following:
 - a. Wear and deterioration of fabric and stitching beyond normal use.
2. Warranty Periods: As follows, from date of Substantial Completion.
 - a. Fabric: Five years.

1.7 EXTRA MATERIALS

A. Furnish extra materials from the same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fabric: minimum 10% of installed fabric in full width, single piece.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Capacity: Design banquettes to support 150 pound static load per lineal foot of seating area.

2.2 BANQUETTE SEATING

- A. Banquettes: See layout and configuration shown on Drawings.
- B. UPH, Upholstery: Refer to Finish Schedule for material selection.
- C. Fabric Upholstered Seat and Back:
 - 1. Backs:
 - a. Padding Thickness: 4 inches.
 - b. Top Corners: Square.
 - c. Upholstery Options: No decorative stitching or pattern.
 - 2. Seats: One part, fully upholstered and as follows:
 - a. Padding Thickness: Minimum 4 inches at front and rear edge. Provide dual density padding, with front edge double wrapped and fastened to underside of cushion.
 - b. Seat Underside: Plywood.
 - c. Seat construction: Fabricate seats to be removable in sections and fully recoverable without damage to the rest of the assembly.
- D. Back Height: See Drawings for height above finished floor.
- E. Back Pitch: See Drawings.

2.3 MATERIALS AND FINISHES

- A. Concealed Plywood: HPVA HP-1 hardwood plywood, made with adhesive containing no urea formaldehyde, or DOC PS 1 softwood plywood, as standard with manufacturer.
- B. Exposed Plywood: HPVA HP-1, Face Grade A, Douglas Fir Grade A veneers to match Architect's sample.
- C. Hardwood: Warp-resistant hardwood frames; screwed and doweled to provide rigid frame.
- D. Springs: If springs are used as part of padding, cover springs with nylon mesh and glue foam covering in place.
- E. Fabric: Fabric as selected by Architect with flame-retardant treatment.
- F. Upholstery Padding: Flexible, cellular, molded or slab polyurethane foam. Fabricator is responsible for selecting foam or combinations of foam suitable for loading as specified. Provide high density foam that will not permanently deform under loading.

2.4 FABRICATION

- A. Floor Attachments: Fabricate to conform to floor and adjacent construction.

- B. Upholstery: Fabricate fabric-covered cushions with molded padding beneath fabric and with fabric covering free of welts, creases, stretch lines, and wrinkles. For each upholstered component, install pile and pattern run in a consistent direction.
- C. Seaming: Construct following approved seaming diagram. Provide reinforcing full length at underside of seams.
- D. Upholstered Seats and Backs: Fabricate as follows:
 - 1. Form seat cushion with formed padding over a five-ply plywood panel with fabric cover conforming to shape of cushion to conceal inner seat structure. Provide cover for internal padding.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine floors and adjacent work and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install seating in locations indicated and fastened securely to substrates where details require.

3.3 PROTECTION

- A. Replace upholstery fabric damaged during installation.
- B. Protect until owner acceptance.

END OF SECTION

SECTION 14 21 23.16

MACHINE ROOM-LESS ELECTRIC TRACTION PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Machine-room-less electric traction service elevators.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
2. Section 03 30 00 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
3. Section 05 12 00 "Structural Steel Framing" for the following:
 - a. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
 - b. Hoist beams.
 - c. Structural-steel shapes for subsills.
4. Section 05 50 00 "Metal Fabrications" for the following:
 - a. Attachment plates and angle brackets for supporting guide-rail brackets.
 - b. Pit ladders.
5. Division 09 for finish flooring in elevator cars.
6. Division 22 for sump pumps, sumps, and sump covers in elevator pits.
7. Division 27 for twisted pair cable for telephone service for elevators.
8. Division 28 for smoke detectors in elevator lobbies to initiate emergency recall operation, for heat detectors in shafts and machine rooms to disconnect power from elevator equipment before or on sprinkler activation, and for connection to elevator controllers.

1.2 DEFINITIONS

A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

B. Defective Elevator Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

C. Service Elevator: A passenger elevator that is also used to carry freight.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include capacities, sizes, performances, operations, safety features, finishes, and similar information.
 2. Include Product Data for car enclosures, hoistway entrances, and operation, control, and signal systems.
- B. Shop Drawings:
1. Include plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment.
 2. Include large-scale layout of car-control station and standby power operation control panel.
 3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
- C. Samples for Initial Selection: For each type of exposed finish involving color selection.
- D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; 3-inch-square Samples of sheet materials; and 4-inch lengths of running trim members.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer.
 - B. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway and pit layout and dimensions, as indicated on Drawings, and electrical service including standby power generator, as shown and specified, are adequate for elevator system being provided.
 - C. Sample Warranty: For special warranty.
- 1.5 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
 - B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
 - C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard five-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.
 - D. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner with terms, conditions, and obligations as set forth in, and in same form as, a "Draft of Elevator Maintenance Agreement" at end of this Section, starting on date initial maintenance service is concluded.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.8 COORDINATION

- A. Coordinate installation of inserts, sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, inserts, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.
- B. Coordinate locations and dimensions of work specified in other Sections that relates to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways and pits.

1.9 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
 - 2. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide KONE,inc; MonoSpace 300DX or comparable product by one of the following:
 - 1. Canton Elevator, Inc.
 - 2. Fujitec America, Inc.
 - 3. ThyssenKrupp Elevator
 - 4. Minnesota Elevator, Inc.
 - 5. Mitsubishi Electric Corporation.
 - 6. Otis Elevator Co.

7. Schindler Elevator Corp.

B. Source Limitations: Obtain elevators, including freight elevators specified in other Sections, from single manufacturer.

1. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44 and applicable building Codes.

B. Accessibility Requirements: Comply with requirements for accessible elevators in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

2.3 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Service Elevator Description:

1. Rated Load: 3500 lb.
2. Freight Loading Class for Service Elevators: Class A.
3. Rated Speed: 150 fpm.
4. Operation System: Selective-collective automatic operation.
5. Auxiliary Operations:
 - a. Standby power operation.
 - b. Standby-powered lowering.
 - c. Battery-powered automatic evacuation.
 - d. Automatic dispatching of loaded car.
 - e. Nuisance-call cancel.
 - f. Loaded-car bypass.
 - g. Automatic operation of lights and ventilation fans.
6. Security Features: Card-reader operation.
7. Car Enclosures:
 - a. Inside Width: Not less than 68 inches from side wall to side wall.
 - b. Inside Depth: Not less than 101 inches from back wall to front wall (return panels).
 - c. Inside Height: Not less than 93 inches to underside of ceiling.
 - d. Front Walls (Return Panels): Satin stainless steel, ASTM A480/480M, No. 4 finish.
 - e. Car Fixtures: Satin stainless steel, ASTM A480/480M, No. 4 finish.
 - f. Side and Rear Wall Panels: Satin stainless steel, ASTM A480/480M, No. 4 finish.
 - g. Reveals: Satin stainless steel, ASTM A480/480M, No. 4 finish.
 - h. Door Faces (Interior): Satin stainless steel, ASTM A480/480M,

- i. Door Sills: Aluminum.
 - j. Ceiling: Enameled or powder-coated steel.
 - k. Handrails: 1/4 by 4 inches rectangular satin stainless steel, at sides and rear of car.
 - l. Floor prepared to receive resilient flooring specified in Section 09 65 19 "Resilient Tile Flooring".
8. Hoistway Entrances:
- a. Width: 54 inches.
 - b. Height: 84 inches.
 - c. Type: Two-speed side sliding.
 - d. Frames: Satin stainless steel, ASTM A480/480M, No. 4 finish.
 - e. Doors: Satin stainless steel, ASTM A480/480M, No. 4 finish.
 - f. Sills: Aluminum.
9. Hall Fixtures: Satin stainless steel, ASTM A480/480M, No. 4 finish.
10. Additional Requirements:
- a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, ASTM A480/480M, No. 4 finish.
 - b. Provide hooks for protective pads in all cars and two complete set(s) of full-height protective pads.

2.4 TRACTION SYSTEMS

- A. Elevator Machines: Permanent magnet, variable-voltage, variable-frequency, ac-type hoisting machines and solid-state power converters.
- 1. Provide regenerative system.
 - 2. Provide regenerative system that complies with the IgCC.
 - 3. Limit total harmonic distortion of regenerated power to 5 percent per IEEE 519.
 - 4. Provide means for absorbing regenerated power when elevator system is operating on standby power.
 - 5. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.
- B. Fluid for Hydraulic Buffers: Fire-resistant fluid.
- C. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.
- D. Machine Beams: Provide steel framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 05 50 00 "Metal Fabrications" for materials and fabrication.
- E. Car Frame and Platform: Bolted- or welded-steel units.
- F. Guides: Roller guides or polymer-coated, nonlubricated sliding guides. Provide guides at top and bottom of car and counterweight frames.

2.5 OPERATION SYSTEMS

- A. Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.
- B. Auxiliary Operations:
 - 1. Single-Car Battery-Powered Automatic Evacuation: If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it moves to the next floor above or below, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
 - 2. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors begin closing.
 - 3. Nuisance-Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled. Preset number of calls and predetermined weight can be adjusted.
 - 4. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after five minutes and are re-energized before car doors open.
- C. Security features shall not affect emergency firefighters' service.
 - 1. Card-Reader Operation: System uses card readers at car-control stations to authorize calls. Security system determines which landings and at what times calls require authorization by card reader. Provide required conductors in traveling cable and panel in machine room for interconnecting card readers, other security access system equipment, and elevator controllers. Allow space for card reader in car.

2.6 DOOR REOPENING DEVICES

- A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.
- B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.7 CAR ENCLOSURES

- A. Provide enameled or powder-coated steel car enclosures to receive removable wall panels, with removable car roof, access doors, power door operators, and ventilation.
 - 1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.
- B. Materials and Finishes: Manufacturer's standards, but not less than the following:
 - 1. Subfloor:
 - a. Exterior, underlayment grade plywood, not less than 5/8-inch nominal thickness.

2. Floor Finish:
 - a. Specified in Section 09 65 19 "Resilient Tile Flooring".
3. Stainless Steel Wall Panels: Flush, formed-metal construction; fabricated from stainless steel sheet.
4. Fabricate car with recesses and cutouts for signal equipment.
5. Fabricate car door frame integrally with front wall of car.
6. Stainless Steel Doors: Flush, hollow-metal construction; fabricated from stainless steel sheet or by laminating stainless steel sheet to exposed faces and edges of enameled or powder-coated steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
7. Sight Guards: Provide sight guards on car doors.
8. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
9. Metal Ceiling: Flush panels, with LED downlights in each panel. Align ceiling panel joints with joints between wall panels.
10. Light Fixture Efficiency: Not less than 35 lumens/W.
11. Ventilation Fan Efficiency: Not less than 3.0 cfm/W.

2.8 HOISTWAY ENTRANCES

- A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.
 1. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.
- B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible according to NFPA 252 or UL 10B.
 1. Fire-Protection Rating: As indicated on Drawings.
- C. Materials and Fabrication: Manufacturer's standards, but not less than the following:
 1. Stainless Steel Frames: Formed from stainless steel sheet.
 2. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than 3 inches high, on both jambs of hoistway door frames.
 3. Stainless Steel Doors: Flush, hollow-metal construction; fabricated from stainless steel sheet or by laminating stainless steel sheet to exposed faces and edges of enameled or powder-coated steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
 4. Sight Guards: Provide sight guards on doors matching door edges.
 5. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
 6. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

2.9 SIGNAL EQUIPMENT

- A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide buttons and lighted elements illuminated with LEDs.
- B. Car-Control Stations: Provide manufacturer's standard recessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.
 - 1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
 - 2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
- C. Emergency Communication System: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)." On activation, system dials preprogrammed number of monitoring station (within building) and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
 - 1. Provide the following Code requirements for two-way voice communications:
 - a. Visual, text-based and video-based 24/7 live interactive communication system.
 - b. Fully accessible by the deaf, hard of hearing, and speech impaired, and shall include voice-only options for hearing individuals.
 - c. Ability to communicate with emergency personnel utilizing existing video conferencing technology, chat/text software, or other technology approved by the AHJ.
- D. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in Division 28.
- E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.
- F. Hall Push-Button Stations: Provide one hall push-button station at each landing for each single elevator or group of elevators, but not less than one station for each four elevators in a group.
 - 1. Provide manufacturer's standard wall-mounted units.
 - 2. Equip units with buttons for calling elevator and for indicating desired direction of travel.
- G. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:
 - 1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.

- H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
- I. Standby Power Elevator Selector Switches: Provide switches, as required by ASME A17.1/CSA B44, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed. For each elevator, provide illuminated signals that indicate when they are operational and when they are at the designated emergency return level with doors open.
- J. Fire-Command-Center Annunciator Panel: Provide panel containing illuminated position indicators for each elevator, clearly labeled with elevator designation; include illuminated signal that indicates when elevator is operational and when it is at the designated emergency return level with doors open. Provide standby power elevator selector switch(es), as required by ASME A17.1/CSA B44, adjacent to position indicators. Provide illuminated signal that indicates when normal power supply has failed.
- K. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.

2.10 FINISH MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.
- C. Stainless Steel Sheet: ASTM A240/A240M, Type 304.
- D. Stainless Steel Bars: ASTM A276, Type 304.
- E. Stainless Steel Tubing: ASTM A554, Grade MT 304.
- F. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Examine hoistways, hoistway openings, and pits as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions.

- B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.
- C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.
- D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.
- E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- F. Leveling Tolerance: 1/8 inch, up or down, regardless of load and travel direction.
- G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- H. Locate hall signal equipment for elevators as follows unless otherwise indicated:
 - 1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

- A. Temporary Use: Limit temporary use for construction purposes to one elevator. Comply with the following requirements for each elevator used for construction purposes:
 - 1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
 - 2. Provide strippable protective film on entrance and car doors and frames.
 - 3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
 - 4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
 - 5. Do not load elevators beyond their rated weight capacity.
 - 6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective

components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s).
- B. Check operation of each elevator with Owner's personnel present before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 1. Perform maintenance during normal working hours.

END OF SECTION