

PROJECT MANUAL - VOLUME 1

OLBRICH BOTANICAL GARDENS – EXPANSION PHASE 1

3330 Atwood Ave
Madison, WI 53704

***BPW CONTRACT #8162 MUNIS 17193
BID ISSUE***

Date: 1 JUNE 2018

ARCHITECT
MSR, Ltd.

LANDSCAPE ARCHITECT
KSD, Inc.

CIVIL ENGINEER
Vierbicher, Inc.

IRRIGATION DESIGN
FRS Design Group, LLC

GREENHOUSE DESIGN
Rough Bros., Inc.

STRUCTURAL AND TECHNOLOGY ENGINEER
IMEG, Inc.

MECHANICAL / ELECTRICAL / PLUMBING ENGINEER AND LIGHTING DESIGNER
MEP Associates

CODE AND LIFE SAFETY SYSTEMS
Summit Fire Consulting

COST ESTIMATING
Middleton CC, Inc.

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MSR, LTD
1 June 2018

1 DIVISION 33 - UTILITIES

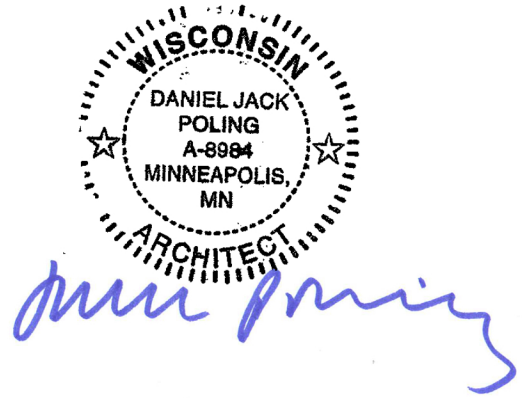
2 33 1113 Public Water Utility Distribution Piping
3 33 4100 Storm Utility Drainage Piping

4 **END OF DOCUMENT**

1.1 DESIGN PROFESSIONALS OF RECORD

A. Architect:

1. Jack Poling, AIA.
2. Wisconsin License Number: A-8984.
3. Responsible for Architectural Design: Spec divisions 1 through 14 except for City-issued Div 1 sections, 024116, Div 3 structural sections, 042200, Div 5 structural sections, 061000, 061800, Divs 27 and 28, 328400, and other sections mentioned below.



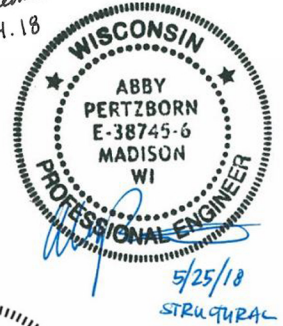
B. Civil Engineer:

1. Matthew Schreiner, PE.
2. Wisconsin License Number: E-41147.
3. Responsible for Civil Engineering: spec sections 033010, 321123, and divisions 31 and 33, except for 312300.



C. Structural Engineer:

1. Abby Pertzborn, PE.
2. Wisconsin License Number: E-38745-6.
3. Responsible for Structural Engineering: structural aspects of spec divisions 03 and 05, and 312300.



D. Greenhouse Structural Engineer:

1. Mohamed A. Aly, PE.
2. Wisconsin License Number: E-35360.
3. Responsible for Greenhouse Structural Engineering: structural aspects of spec section 133413.



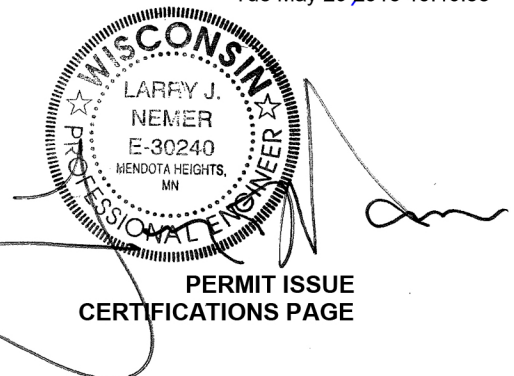
E. Fire-Protection Engineer:

1. Michael Nakhla, FPE.
2. Wisconsin License Number: E42619-6
3. Responsible for Fire Protection Engineering: spec section 211000.



F. Mechanical and Plumbing Engineer:

1. Larry Nemer, PE.
2. Wisconsin License Number: E-30240.
Responsible for Mechanical and Plumbing Engineering: spec divisions 22 and 23.



G. Electrical Engineer:

1. Randall Jacobs.
2. Wisconsin License Number: 35771.
3. Responsible for Electrical Engineering and Fire Alarm system design: spec division 26 and section 283111.



H. Landscape Architect:

1. David Ken Saiki.
2. Wisconsin License Number: LA-76.
3. Responsible for Landscape design: spec division 32 except for section 321123.



END OF DOCUMENT 000107

DOCUMENT 003126

EXISTING HAZARDOUS MATERIAL INFORMATION

PART 1 – GENERAL

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. An existing asbestos report for Project, prepared by A & A Environmental Services, dated February 22, 2018, is available for viewing as appended to this Document.
- C. Related Requirements:
 - 1. Section 02 41 19 "Selective Structure Demolition" for notification requirements if materials suspected of containing hazardous materials are encountered.

END OF DOCUMENT 00 31 26

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A&A

ENVIRONMENTAL SERVICES

P.O. Box 708 • Poynette, WI 53955
Phone: (608) 635-8491 • Email: Office@aaenv.com • Fax: (608) 635-9717
INSPECTION

February 22, 2018

Randall Wiesner
City of Madison
210 Martin Luther King, Jr. Blvd., Rm 115
Madison, WI 53703-3342
(608) 266-4366, Fax (608) 264-9275
rwiesner@cityofmadison.com

RE: 3330 Attwood Avenue, Madison, WI

On February 16, 2018 an asbestos inspection for a renovation was done on the materials that are to be disturbed during this renovation.

Asbestos Inspection

Bulk samples were collected and analyzed for asbestos content by polarized light microscopy (PLM). The following materials were reported >1% asbestos or are assumed to contain greater than 1% asbestos that will become friable during conventional demolition. These materials must be properly removed prior to conventional demolition or fire training burn.

- None

The following building materials are assumed to contain asbestos in good condition. These materials must be properly disposed of at an engineered landfill. These materials may not be recycled.

- None

The following building materials were sampled and reported as no asbestos detected:

- Ceiling tile
- Ceramic tile grout
- Ceramic tile thin set
- Window glazing
- Window caulking
- Door caulking
- Pipe insulation
- Pipe fitting mastic

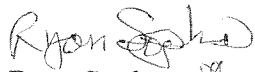
Building Information:

15,000 Sq Ft
1 Stories
0 Living Unit
70 Years Old
1 Building
Dane County

A&A Environmental Services Inc.'s inspectors are only able to inspect open, safe, and accessible areas inside and outside of the building. Inaccessible suspect material may be hidden throughout this building. Any additional suspect materials discovered during the course of abatement/demolition/remodeling must be assumed to be ACM until sampled by and EPA/State of Wisconsin certified asbestos inspector and proven negative.

If you have any questions concerning this report or the sampling performed please feel free to contact me.

Sincerely,



Ryan Sopha
President/Inspector #AII14676

Encl

RAS/bls

February 20, 2018

A & A Environmental Services
PO Box 708
Poynette, WI 53955

CLIENT PROJECT: City Of Madison; 338
CEI LAB CODE: A18-2751

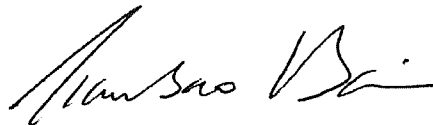
Dear Customer:

Enclosed are asbestos analysis results for PLM Bulk samples received at our laboratory on February 19, 2018. The samples were analyzed for asbestos using polarizing light microscopy (PLM) per the EPA 600 Method.

Sample results containing >1% asbestos are considered asbestos-containing materials (ACMs) per EPA regulatory requirements. The detection limit for the EPA 600 Method is <1% asbestos by weight as determined by visual estimation.

Thank you for your business and we look forward to continuing good relations. If you have any questions, please feel free to call our office at 919-481-1413.

Kind Regards,



Tianbao Bai, Ph.D., CIH
Laboratory Director



CEI

ASBESTOS ANALYTICAL REPORT
By: Polarized Light Microscopy

Prepared for

A & A Environmental Services

CLIENT PROJECT: City Of Madison; 338

LAB CODE: A18-2751

TEST METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

REPORT DATE: 02/20/18

TOTAL SAMPLES ANALYZED: 7

SAMPLES >1% ASBESTOS:

TOTAL LAYERS ANALYZED: 7

TEL: 866-481-1412

www.ceilabs.com



CEI

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: City Of Madison; 338

LAB CODE: A18-2751

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
1		A2630424	Black	Door & Window Caulk	None Detected
2		A2630425	Gray	Window Caulk	None Detected
3		A2630426	Yellow/Silver	Pipe Insulation	None Detected
4		A2630427	White	Fitting Mastic	None Detected
5		A2630428	White	Ceiling Tile	None Detected
6		A2630429	Brown	Thinset - Ceramic Tile	None Detected
7		A2630430	Beige	Grout - Ceramic Tile	None Detected



CEI

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: A & A Environmental Services
 PO Box 708
 Poynette, WI 53955

Lab Code: A18-2751
Date Received: 02-19-18
Date Analyzed: 02-20-18
Date Reported: 02-20-18

Project: City Of Madison; 338

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS			ASBESTOS %	
			Fibrous	Non-Fibrous			
1 A2630424	Door & Window Caulk	Homogeneous Black Fibrous Bound	2%	Cellulose	98%	Caulk	None Detected
2 A2630425	Window Caulk	Homogeneous Gray Fibrous Bound	2%	Cellulose	98%	Caulk	None Detected
3 A2630426	Pipe Insulation	Heterogeneous Yellow/Silver Fibrous Bound	10% 80%	Cellulose Fiberglass	10%	Metal Foil	None Detected
4 A2630427	Fitting Mastic	Homogeneous White Fibrous Bound	2% 3%	Cellulose Talc	60% 35%	Mastic Calc Carb	None Detected
5 A2630428	Ceiling Tile	Homogeneous White Fibrous Loosely Bound	95% 5%	Fiberglass Mineral Wool			None Detected
6 A2630429	Thinset - Ceramic Tile	Homogeneous Brown Fibrous Bound	2%	Cellulose	60% 38%	Binder Silicates	None Detected
7 A2630430	Grout - Ceramic Tile	Homogeneous Beige Fibrous Bound	2%	Cellulose	60% 38%	Binder Silicates	None Detected

LEGEND: Non-Anth = Non-Asbestiform Anthophyllite
Non-Trem = Non-Asbestiform Tremolite
Calc Carb = Calcium Carbonate

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

REPORTING LIMIT: <1% by visual estimation

REPORTING LIMIT FOR POINT COUNTS: 0.25% by 400 Points or 0.1% by 1,000 Points

REGULATORY LIMIT: >1% by weight

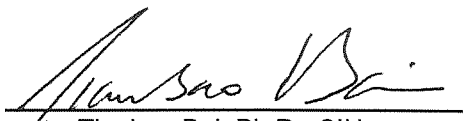
Due to the limitations of the EPA 600 method, nonfriable organically bound materials (NOBs) such as vinyl floor tiles can be difficult to analyze via polarized light microscopy (PLM). EPA recommends that all NOBs analyzed by PLM, and found not to contain asbestos, be further analyzed by Transmission Electron Microscopy (TEM). Please note that PLM analysis of dust and soil samples for asbestos is not covered under NVLAP accreditation. Estimated measurement of uncertainty is available on request.

This report relates only to the samples tested or analyzed and may not be reproduced, except in full, without written approval by Eurofins CEI. Eurofins CEI makes no warranty representation regarding the accuracy of client submitted information in preparing and presenting analytical results. Interpretation of the analytical results is the sole responsibility of the client. Samples were received in acceptable condition unless otherwise noted. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. Government.

ANALYST:


Shilpa Ladekar

APPROVED BY:


Tianbao Bai, Ph.D., CIH
Laboratory Director

NVLAP[®]
TESTING
NVLAP LAB CODE 101768-0

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DOCUMENT 00 31 32

GEOTECHNICAL DATA

1.1 GEOTECHNICAL DATA

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.
- B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.
- C. Soil-boring data for Project, **as appended to this Document.**
- D. A geotechnical investigation report for Project, **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 003126 "Existing Hazardous Material Information" for hazardous materials reports that are made available to bidders.

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Construction • Geotechnical
Consulting Engineering/Testing

October 4, 2017
C17051-22

Mr. Randy Wiesner
City of Madison, Department of Public Works
Engineering Division, City-County Building, Room 115
210 Martin Luther King, Jr Blvd
Madison, WI 53703-3342

Re: Geotechnical Exploration
Proposed Learning Center and Greenhouses
Olbrich Botanical Gardens
Madison, Wisconsin

Dear Mr. Wiesner:

Construction • Geotechnical Consultants, Inc. (CGC) has completed the subsurface exploration program for the above-referenced project. The purpose of this program was to evaluate the subsurface conditions within the proposed construction areas and to provide geotechnical recommendations regarding site preparation, foundation, floor slab and pavement design/construction. Seismic site class and stormwater infiltration potential will also be discussed. An electronic copy of this report is provided for your use and a paper copy can be provided upon request.

PROJECT AND SITE DESCRIPTION

We understand that a new, single-story slab-on-grade learning center addition is being proposed along the northeast side of the existing building. The addition is expected to be a combination of wood, steel and masonry construction, similar to the existing building, with the floor slab matching the existing building at approximately EL 854 ft. Although foundation loads were not provided at the time of this report, we anticipate fairly light to moderate building loads typical of a single-story, slab-on-grade construction.

The proposed greenhouses will be located to the northwest of the existing building, in the area where the existing glass greenhouse and hoop houses are located. We anticipate the lightly loaded greenhouse structures will be a combination of steel and glass construction, with the slab-on-grade founded at or near existing site grades in the area.

In addition to the proposed structures, we understand that stormwater management features are planned to the north of the existing building and west of the learning center. Minor grading and re-shaping of existing pavement areas may also occur during construction. Site grades within the limits of the proposed construction are relatively flat, and the ground surface is either landscaped (existing gardens) or paved with asphalt, concrete or pavers. We understand that former utilities associated with Sugar Avenue were removed and the trenches were backfilled northwest of the existing greenhouses (near B5 and B6).



Mr. Randy Wiesner
City of Madison, Department of Public Works
October 4, 2017
Page 2

SUBSURFACE CONDITIONS

Subsurface conditions on site were explored by drilling 11 Standard Penetration Test (SPT) soil borings to planned depths of 15 to 20 ft below existing site grades. The four 15-ft deep borings in proposed stormwater management areas are numbered P-1 through P-4, and the seven 20-ft deep building addition and greenhouse borings are numbered B-1 through B-7. The boring locations were selected by the project team, with locations adjusted slightly in the field by the drillers to avoid conflicts with utilities and existing landscaped features. The borings were drilled on September 18, 19 and 20, 2017 by Badger State Drilling (under subcontract to CGC) using an ATV-mounted D50 drill rig equipped with hollow-stem augers and an automatic SPT hammer. The boring locations are shown in plan on the Soil Boring Location Exhibit attached in Appendix B. Ground surface elevations at the boring locations were surveyed by R.A. Smith National.

The subsurface profile at the boring locations is fairly uniform and can generally be described by the following strata (in descending order):

- About 7 to 13 in. *topsoil fill* or 6 to 9.5 in. of *pavement layers* (Borings B-5 and B-6), over
- About 3 to 10.5 ft of *fill* generally involving very loose to medium dense sand and/or stiff clay, followed by
- About 2.5 to 6.5 ft of sedimentary to fibrous *peat*, with organic contents (by loss on ignition) ranging from 13 to 61 percent, underlain by
- Very loose to medium dense *sand strata* starting at a depth of about 8.5 to 13.5 ft below existing grade and extending to the maximum depths explored.

Exceptions to the above profile include the following:

- 2.5-ft thick *topsoil fill* layer in Boring B-3.
- Portions of the fill layers near Borings B-1 and B-7, as well as P-1 contains portions of cinders, glass and organics.
- The peat layer has apparently been removed and replaced with engineered fill near Borings B-3, B-5 and B-6, as well as P-3. The fill was granular in nature and typically exhibited medium dense relative density in the proposed building areas, except at Boring B3 where a very loose layer was encountered.
- 1.5 to 5 ft of medium stiff *clay* or *sand strata with thin peat and clay seams* near Borings B-3, B-5 and B-6, as well as P-3.

As noted above, it appears that the peat layer has apparently been removed within a few of the borings, during undercutting and replacement operations during construction of the existing building, or other construction (e.g., utility construction). Although the fill encountered at these locations generally appears to be fairly uniform and granular in nature, very loose to loose conditions were encountered in Boring B-3, located near the planned learning center addition. In addition, because the lateral extent of apparent undercutting/replacement beyond the existing building is not known, we recommend that the existing



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granular fill soils be further evaluated by CGC during initial stages of site development to check their suitability for foundation and floor slab support, and to determine whether partial or complete undercutting/replacement is required.

Note that aside from shallow fill, the soil profile described above is fairly typical for this vicinity, based on our past explorations nearby. This part of the Madison area was apparently a lake bottom during glacial periods and later became a marsh as sediments (including peat and soft clay) accumulated with time. Like much of the Isthmus, the lower-lying areas were subsequently filled and developed. The native sand strata typically found with depth in each boring represent fairly competent deposits of 'clean' sand deposited on the former lake bed.

Natural moisture and organic content tests were performed on representative organic peat and clay samples, and the results are included in the right hand columns on the boring logs. The organic layers have high to very high moisture and organic contents, indicating that they are moderately to highly compressible and subject to significant long-term decomposition.

Groundwater was encountered at depths of 4.5 to 8 ft below the ground surface in the borings during or shortly after drilling. Groundwater levels are expected to fluctuate with seasonal variations in precipitation, infiltration, evapotranspiration, the level of Lake Monona just to the south, and other factors. We anticipate that groundwater levels encountered during construction will likely reflect the normal surface water level for Lake Monona at about EL 846 ft (USGS datum), or about 4 to 7 ft below the existing ground surface elevations across the site. A more detailed description of the site soil and groundwater conditions is presented on the Soil Boring Logs are included in Appendix B.

CGC completed six soil borings near the existing building as part of a subsurface exploration program in 2013 (see CGC Report No. C13064-5, dated July 10, 2013). The soil profiles encountered in those borings are generally similar to the profile described above, and the soil boring location exhibit and boring logs from 2013 are attached in Appendix B for reference.

DISCUSSION AND RECOMMENDATIONS

1. Overview

Subject to the limitations discussed below and based on the subsurface exploration, it is our opinion that the site is generally suitable for the proposed construction, and that the structures can be supported by conventional spread footing foundations. *However, development of the planned buildings is complicated by the presence of peat and softer organic layers which extend to between about 8.5 and 11 ft below existing site grades.* The peat and organic clay layers are moderate to highly organic and very compressible in the short-term, and are subject to decomposition causing further settlement in the long term. Therefore, these layers are not considered suitable for direct foundation and floor slab support due to the likelihood of unacceptable settlement occurring due to the weight of the new structure. Shallow groundwater, which is anticipated to be near the level of nearby Lake Monona at about EL 846 ft, or about 4 to 7 ft below existing site grades, will also need to be addressed during construction.



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Because the organic soils are considered unsuitable for foundation and floor slab support, additional steps will be required during site development in order for the proposed buildings to be supported utilizing a standard spread footing foundations. Based on the absence of the peat layer in Borings B-3, B-5 and B-6 (as well as BB-1, 2013), and the presence of apparently well-compacted granular fill in its place, it appears that undercutting/replacement of the peat layer was previously completed during development of the existing building. Based on the satisfactory performance of the existing building and indications that the undercutting and replacement of the peat layer likely extended at least some distance beyond the existing building footprint, it is our opinion that a similar approach will likely prove economical for the planned addition and greenhouses. However, there will be some significant costs associated with this approach, most notably dewatering, and we are also therefore providing a brief description of an alternative foundation system for possible further consideration.

In light of the soil and groundwater conditions described above, our recommendations for site preparation, foundation, floor slab and pavement design/construction, as well as seismic site class and stormwater infiltration potential, are presented in the following subsections. Additional information regarding the conclusions and recommendations presented in this report is discussed in Appendix C.

2. Site Preparation

A. General Site Preparation

We recommend that the surficial topsoil and pavement be stripped/removed at least 10 to 20 ft beyond the proposed construction areas, including areas required for cuts and fills beyond the proposed building footprint or pavement limits. Topsoil stripping should extend to at least the edge of expected undercut excavations, which would extend 11 to 13.5 ft below existing grade and require excavation side slopes of 1.5H:1V, or flatter. The topsoil can be stockpiled on-site and re-used as fill in landscaped areas. To create fairly uniform bearing conditions for the new structure, existing structures to be removed (if any) should be demolished and removed in their entirety (including foundations, walls, slabs and utilities). Trees/roots should be removed in conjunction with topsoil removal.

Following site stripping, the exposed subgrade soils are generally expected to consist of existing mixed fill. Exposed soils in site or pavement areas to receive fill (if any) or at finished subgrade should be proof-rolled with a large, rubber-tired piece of construction equipment (i.e., loaded dump truck, front-end loader). If soft/yielding areas are observed, they should be undercut/removed. Grade should be re-established using granular backfill compacted to at least 95% compaction based on modified Proctor methods (ASTM D1557) or compacted coarse aggregate (select crushed material or 3-in. dense graded base course (DGB), as described in Appendix D).

B. Dewatering Considerations

The unsuitable organic soils which require undercutting within the limits of the proposed buildings extend up to about 11 ft below existing grade (potentially deeper) and about 6 ft below the level of nearby Lake Monona, so construction dewatering will be needed to lower the groundwater level below this level (about EL 846 ft). To allow for undercutting/replacement to occur “in the dry” and to prevent disturbance



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of the deeper sand bearing stratum during undercutting and foundation excavation, we recommend that the groundwater table be lowered at least 2 ft below the bottom of the planned excavation depths (e.g., bottom of the required undercut or proposed foundation) in advance of excavation. For excavations extending less than about 1 to 2 ft below the ground water table, dewatering can probably be accomplished using sumps operating from filtered sumps. Where excavations extend more than 2 ft below the groundwater table, effective dewatering generally requires a series of deep wells or vacuum well point system. To prevent the loss of ground during pumping, well screens must be properly sized, in good condition, and backfilled with effective filter sand. The dewatering system should also include a backup system (e.g., alarm with backup generator) in case of a power failure. *Failure to dewater the site effectively could result in loosening of the sand bearing stratum, possibly leading to excessive settlement and loss of bearing capacity below the structure.* Nearby structures should be monitored during dewatering to check for possible settlement due to the dewatering operation. The dewatering effluent should also be discharged into a sedimentation tank to check for and remove soil prior to being discharged. Accumulating sediment in the tank may indicate improper well screens or filter material, which requires adjustment to prevent soil loss below existing and new buildings.

It is imperative that the underlying soils are effectively dewatered prior to excavation to prevent loosening of the natural sand soils during undercutting and backfilling operations.

C. Undercutting and Replacement

Due to the poor quality of the organic soils encountered on the site, we recommend undercutting these soils *within the entire limits of the proposed buildings to expose firm natural sand soils.* Undercut depths within the proposed buildings are expected to be on the order of about 8 to 11 ft below existing site grades (potentially deeper in some areas), 4.5 to 10 ft below footing grade and about 9 to 13 ft below the floor slabs, which corresponds to about 3 to 6 ft below the anticipated groundwater level of EL 846 ft (Lake Monona). For stress distribution purposes, the mass undercut excavations should be laterally oversized beyond the perimeter footing edges a minimum of 0.5 ft for each foot of undercut depth. The undercut excavations should be sloped in accordance with OSHA guidelines. *The appropriate excavation side slopes should be determined by a competent person completing the earthwork in accordance with OSHA slope guidelines.*

Depending on the lateral extent of previous undercutting/replacement operations outside the footprint of the existing building, undercutting may be required in close proximity to the existing building and undermining of the existing footings could potentially be an issue. Temporary underpinning and/or shoring (earth retention) may be required and care should be exercised not to undermine the existing foundations. If required, the shoring and/or underpinning systems are the responsibility of the earthwork contractor, and we recommend the systems be designed by an appropriately qualified professional engineer. Recommendations regarding undercutting and stabilization of the exposed sand soils below the water table at the base of the undercut excavations are outlined in detail below:

- As noted above, the excavations to remove unsuitable organic soils are estimated to extend up to about 6 ft below the water table, and a dewatering system will be required to control and temporarily lower the groundwater. The dewatering system should lower the



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water table at least 2 ft below the anticipated excavation depths in advance of excavation. Dewatering was discussed in detail above, and the means and methods are the responsibility of the contractor and should not be underestimated.

- Following the lowering of the groundwater to about 2 ft below the anticipated excavation depths, excavation to remove unsuitable existing fill and organic soils within, and about 5 to 10 ft beyond the proposed building footprint can begin. We recommend that undercutting begin at a point away from the existing building and proceed systematically towards the building until suitable natural soils, or perhaps suitable existing granular fill soils placed during previous undercutting/replacement are encountered. As noted above, although the existing granular soils apparently placed following previous undercutting/replacement operations appear to be fairly uniform and generally well-compacted, some undercutting may be required to remove loose soils (e.g., Boring B-7) potentially placed in the over dig area outside the zone of influence of the existing building. We recommend that CGC staff be present during undercutting operations to check that suitable soil conditions exist at the base of the undercut prior to backfill placement to restore subgrade elevations.
- Upon reaching suitable natural sand soils at the base of the undercut excavation, immediately place a geotextile fabric (Mirafi 500X or equivalent) on the exposed subgrade, followed by a minimum of 12 in. of 3-in. clear stone (or similar stone material with minimal fines). The stone should be compacted into the subgrade for stabilization purposes. Temporary pumping from a filtered sump placed within the stone layer can be utilized to help control inflowing groundwater during the undercutting and backfilling operation to supplement the primary dewatering system (i.e., wells, well points, etc.). Additional clear stone can be placed and compacted to extend above the groundwater level. Note that the geotextile and stone stabilization layers may not be required if suitable existing granular fill soils are encountered well above the groundwater table. However, the existing fill soils should be thoroughly recompacted and carefully checked prior to foundation construction (discussed below) or prior to new backfill placement (where required) to establish foundation and floor slab elevations.
- Proceed with undercutting and stone placement in small sections. Take care to thoroughly compact the stone with a large walk-behind vibratory plate compactor or hoe-pak plate compactor until no further deflection is evident in the stone layer. The geotextile layer should be continuous below the stone layer, including a 2-ft overlap between adjacent panels, and draped up the side of the excavation to tie into the later fabric panels as the excavation proceeds.
- As noted above, care should be exercised when excavating adjacent to the existing building to help prevent undermining the existing foundation. Temporary earth retention or underpinning of existing foundation may be required. As an alternative, undercutting could potentially be completed in short (4-ft wide) sections along the existing building followed by immediately backfilling with compacted stone or lean mix concrete



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(minimum 28-day compressive strength of 1,000 psi) prior to excavating adjacent sections. If lean mix is used, adequate curing time should be allowed prior to excavating the next section.

- Following removal of the unsuitable soils below the water table and placement of sufficient stone stabilization layer to extend above the water level (after it has been lowered as much as practical by pumping from sumps), the excavation can be restored to footing and floor slab elevations using less expensive granular fill compacted in thin lifts (less than 12-in. loose) to 95% of modified Proctor dry density (ASTM D1557), following the guidelines in Appendix D. The existing granular fill soils encountered in the borings generally appear suitable for re-use as undercut backfill within the limits of the proposed buildings provided they are selectively separated and stockpiled from the underlying organic soils (or unsuitable organic and clay fill soils near B-1 and B-7). However, before placing the sand fill, the top and sides of the stone layer should be enveloped with a non-woven geotextile fabric (e.g., Mirafi 160N, or similar) to separate the clear stone from surrounding soils that could migrate into the voids in the clear stone. Periodic field density tests performed by CGC are recommended to check the adequacy of the compactive effort on the layer of sand fill.

3. Foundation Design

A. Undercutting and Replacement

Provided that the site is effectively dewatered prior to undercutting and replacement of the unsuitable existing fill and organic soils following recommendations outlined above, it is our opinion that the proposed structure can be supported on reinforced concrete spread footing foundations bearing on recompacted suitable existing granular fill or newly-placed engineered fill placed following undercutting. As discussed above, additional undercutting to remove unsuitable existing fill soils apparently placed during previous construction activities may be required during foundation construction. The following parameters should be used for foundation design:

- Maximum allowable bearing pressure: 2,000 psf
- Minimum foundation widths:
 - Continuous wall footings: 18 in.
 - Column pad footings: 30 in.
- Minimum footing depths:
 - Exterior/perimeter footings: 4 ft
 - Interior footings: no minimum requirement

Where undercutting is required, the base of the undercut excavations should be widened beyond the footing edges at least 0.5 ft in each direction for each foot of undercut depth for stress distribution purposes. Granular backfill should be placed and compacted to 95% compaction (modified Proctor –



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ASTM D1557) to restore footing grade; alternatively, 3-in. DGB compacted in 12-in. loose lifts until deflection ceases could also be used. Where undercutting is required near to below the groundwater table, the undercut should be restored with clear stone that is compacted with a hoe-pak until deflection ceases. If the clear stone thickness exceeds 1 ft, the clear stone should be enveloped in a non-woven geotextile fabric (e.g., Mirafi 160 N or equivalent).

Although we anticipate that building footings will generally bear greater than 2 ft above the water table, where deeper footings (if any) will bear within about 1 to 2 ft of the water table, we recommend including a working mat of 4 to 6 in. of compacted crushed clear stone to stabilize the bottom of the excavation. (Lean mix concrete within a minimum 28-day compressive strength of 1,000 psi could also be used to develop a working mat and protect the subgrade.) Pumping from filtered sump pits to remove the water and/or placement of a clear stone layer immediately after excavation to minimize subgrade disturbance should be anticipated for drawdowns of less than about 1 to 2 ft. As discussed in detail above, greater groundwater drawdowns will likely require well points or deep wells, and dewatering means and methods are the responsibility of the contractor.

We recommend using a smooth-edged backhoe bucket for footing excavations. New and suitable existing granular fill soils exposed at footing grade and at least 2 ft above the water table should be thoroughly recompacted with a large vibratory compactor to densify soils loosened during excavation. Provided the foundation design/construction recommendations discussed above are followed, we estimate that total and differential settlements should not exceed 1.0 and 0.5 in., respectively. CGC should be present during footing excavations to check whether subgrades are satisfactory for the design bearing pressure and to advise on corrective measures, where necessary.

B. Deep Foundation Alternative

Although it is our understanding that the undercut/replacement foundation support alternative has been successfully used on this site in the past, helical piers could potentially be used as an alternative for foundation and structural slab support. In this approach, helical piers would be designed to extend through the fill, organic, and softer clay soils, and bear within the underlying medium dense sand strata. *Allowable* pier capacities (in compression) in the range of 15 to 25 kips (potentially higher) could likely be developed, though the capacity will vary depending on the number and size of helices, depth of installation and bearing stratum. Under the helical pier alternative, dewatering costs would largely be eliminated, but as noted above, the foundations and floor slab would both require support by helical piers, potentially leading to increased costs. As these types of foundation elements would likely extend below the bottom of the borings, additional exploration is recommended if this alternative is to be considered in place of the undercutting/replacement option. More detailed recommendations can be provided at that time, if desired.

4. Site Class for Seismic Design

In our opinion, the average soil/rock properties in the upper 100 ft of the site (based on SPT blow counts (N-values) greater than 15 blows/ft on average) can be characterized as a stiff soil profile. This



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characterization would place the site in Site Class D for seismic design according to the International Building Code (see Table 1613.5.2) assuming the peat is addressed as described above.

5. Floor Slab

Under the undercutting and replacement option, the floor slab for the proposed addition would be supported on newly compacted fill and in our opinion may be designed using a subgrade modulus of 100 pci. Prior to slab construction, the subgrades should be recomacted to densify soils that may become disturbed or loosened during construction activities. The design subgrade modulus is based on a recomacted subgrade such that non-yielding conditions are developed. To serve as a capillary break, the final 4 in. of soil placed below the slabs should consist of imported well-graded sand or gravel with no more than 5 percent by weight passing a No. 200 U.S. standard sieve. (Note that some structural engineers require a 4 to 6 in. layer of dense-graded base course immediately below the floor slab, in lieu of the capillary break, to improve the subgrade modulus.) If a minimum of 6 in. of dense graded base is used below the slab the subgrade modulus can be increased to 150 pci. To minimize the potential for moisture migration, a plastic vapor barrier can also be utilized. Fill placed below the floor slabs should be placed as described in the Site Preparation section of this report. The slabs should be structurally separate from the foundations, have construction joints and reinforcement for crack control.

6. Pavement Design

We anticipate that pavement design will be controlled by the shallow existing variable fill soils. Subgrades should be prepared as described in the Site Preparation section of this report, with proof-rolling completed prior to base course placement and paving. *Based on the presence of existing fill, marginal natural clays and underlying organic peat soils expected in the pavement areas, we anticipate some undercutting/replacement will be required to develop a suitable subgrade for pavement support, and we recommend that the project budget include a contingency for subgrade improvement.* Accordingly, we have included a stabilization layer in the recommended pavement sections. The thickness of the stabilization layer can potentially be reduced if firm conditions existing during subgrade preparation (discussed in Site Preparation section).

We anticipate that asphalt pavement on this site will be exposed to primarily automobile traffic with less than one 18-kip equivalent single axle load (ESAL) per day. In view of this, we have assumed Traffic Class I following Wisconsin Asphalt Pavement Association (WAPA) recommendations for parking areas and driveways that are mainly used by light passenger automobiles. However, main sections of driveways are likely to experience heavier traffic loads (e.g., due to delivery and maintenance vehicles). For pavement areas where trucks will routinely travel, we have assumed a traffic load of less than 10 ESALs per day and Traffic Class II according to WAPA. The pavement sections summarized in Table 1 below were selected assuming a Soil Support Value "SSV" of less than 1 that improves to approximately 4 with the inclusion of the stabilization layer, as well as a design life of 20 years.



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TABLE 1
Recommended Pavement Sections

Material	Thicknesses (in.)		WDOT Specification ⁽¹⁾
	Traffic Class I (Light Duty)	Traffic Class II (Medium Duty)	
Bituminous Upper Layer ⁽²⁾⁽³⁾	1.5	1.75	Section 460, Table 460-1, 9.5 mm
Bituminous Lower Layer ⁽²⁾⁽³⁾	2.0	2.25	Section 460, Table 460-1, 12.5 mm
Dense Graded Base Course ⁽²⁾⁽⁴⁾	8.0	10.0	Sections 301 and 305, 3 in. and 1¼ in.
Stabilization Layer ⁽⁵⁾	12.0	12.0	Sections 301 and 305, 75mm
Total Thickness	23.5	26.0	

Notes:

1. Wisconsin DOT *Standard Specifications for Highway and Structure Construction*, latest edition, including supplemental specifications, and Wisconsin Asphalt Pavement Association *2016 Asphalt Pavement Design Guide*.
2. Compaction requirements:
 - Bituminous concrete: Refer to Section 460-3.
 - Base course: Refer to Section 301.3.4.2, Standard Compaction
3. Mixture Type LT (or E-0.3) bituminous; refer to Section 460, Table 460-2 of the *Standard Specifications*.
4. The upper 4 in. should consist of 1¼-in. DGB; the bottom part of the layer can consist of 3-in. DGB.
5. Stabilization layer can potentially be reduced if firm subgrade conditions exist when proof-rolled during subgrade preparation. Conversely, if very soft and unstable conditions exist, the stabilization layer may need to be increased and include woven geotextile fabric (e.g., Mirafi 600X or equivalent) or biaxial geogrid (e.g., Tensar BX1100/Type 1 or equivalent).



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Note that if traffic volumes are greater than those assumed, CGC should be allowed to review the recommended pavement sections and adjust them accordingly. Alternative pavement designs may prove acceptable and should be reviewed by CGC. If there is a delay between subgrade preparation and placing the base course, the subgrade should be recompact.

Where concrete pavement may be used, such as in pavement areas subjected to concentrated wheel loads (e.g., dumpster pads), we recommend that the concrete should be at least 6 in. thick and contain mesh reinforcement for crack control. Concrete slabs underlain by a minimum 6-in. thick dense graded base layer over a firm or stabilized subgrade can be designed utilizing a subgrade modulus of 100 pci. Undercutting/stabilization may be required below rigid pavement, as discussed above for flexible pavement.

7. Stormwater Infiltration Potential

We understand that stormwater management areas are being considered north of the proposed learning center near Borings P-1 through P-4. Based on the variable, but predominantly low permeability soils that extend to groundwater at fairly shallow depths, it is our opinion that this site is not suitable for infiltrating significant quantities of stormwater. According to NR151, this site may qualify as “excluded” due to the shallow groundwater and “exempt” due to the shallow low permeability soils. The Wisconsin Department of Safety & Professional Services Soil Evaluation form for the four stormwater borings is included in Appendix E.

During construction, appropriate erosion control should be provided to prevent eroded soil from contaminating the stormwater management areas. Where appropriate, the stormwater management design should include pretreatment to remove fine-grained soils (silt/clay) from stormwater prior to entering the stormwater management areas. Additionally, a regular maintenance plan should be developed to remove silt/clay soils that may accumulate in the bottom of the stormwater management areas over time. Failure to adequately control fine-grained soils from entering the stormwater management area or failure to regularly remove fine-grained soils that accumulate at the base of the stormwater management area will likely cause the system to fail. Refer to WDNR Conservation Practice Standards 1002, 1003 and 1004, as well as NR 151 for additional information.

CONSTRUCTION CONSIDERATIONS

Due to variations in weather, construction methods and other factors, specific construction problems are difficult to predict. Soil related difficulties which could be encountered on the site are discussed below:

- Due to the potentially sensitive nature of the on-site soils, we recommend that final site grading activities be completed during dry weather, if possible. Construction traffic should be avoided on prepared subgrades to minimize potential disturbance.
- Contingencies in the project budget for subgrade stabilization with coarse aggregate in parking and floor slab areas should be increased if the project schedule requires that work proceed during adverse weather conditions.



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- Earthwork construction during the early spring or late fall could be complicated as a result of wet weather and freezing temperatures. During cold weather, exposed subgrades should be protected from freezing before and after footing construction. Fill should never be placed while frozen or on frozen ground.
- Excavations extending greater than 4 ft in depth below the existing ground surface should be sloped or braced in accordance with current OSHA standards.
- Based on observations made during the field exploration, groundwater infiltration into deeper foundation or undercut excavations should be anticipated. For groundwater drawdowns of less than about 1 to 2 ft, groundwater can usually be adequately controlled using pumps operating from filtered sump pits. Groundwater drawdowns of more than 1 to 2 ft typically require well points or deep wells. Additional water accumulating at the base of excavations as a result of precipitation should be controlled and quickly removed using pumps operating from filtered sump pits. Dewatering means and methods are the contractor's responsibility.
- As noted above, care should be exercised when excavating near the existing building to avoid undermining its foundation. Temporary earth retention and/or underpinning systems may be required and are the responsibility of the earthwork contractor.

RECOMMENDED CONSTRUCTION MONITORING

The quality of the foundation, floor slab and pavement subgrades will be largely determined by the level of care exercised during site development. To check that earthwork and foundation construction proceeds in accordance with our recommendations, the following operations should be monitored by CGC:

- Topsoil stripping/subgrade proof-rolling within the construction areas;
- Fill/backfill placement and compaction;
- Foundation excavation/subgrade preparation; and
- Concrete placement.

* * * * *



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It has been a pleasure to serve you on this project. If you have any questions or need additional consultation, please contact us.

Sincerely,

CGC, Inc.

Alex J. Bina, P.E.
Senior Staff Engineer

David A. Staab P.E., LEED AP
Senior Consulting Professional

- Encl: Appendix A - Field Exploration
Appendix B - Soil Boring Location Exhibit
Logs of Test Borings (7)
Soil Boring Location Exhibit (2013)
Logs of Test Borings (2013)
Log of Test Boring-General Notes
Unified Soil Classification System
Appendix C - Document Qualifications
Appendix D - Recommended Compacted Fill Specifications
Appendix E - Wisconsin Department of Safety & Professional Services Soil Evaluation Forms

APPENDIX A

FIELD EXPLORATION REPORT

APPENDIX A

FIELD EXPLORATION

Subsurface conditions on site were explored by drilling 11 Standard Penetration Test (SPT) soil borings to planned depths of 15 to 20 ft below existing site grades. The four 15-ft deep borings in proposed stormwater management areas are numbered P-1 through P-4, and the seven 20-ft deep building addition and greenhouse borings are numbered B-1 through B-7. The boring locations were selected by the project team, with locations adjusted slightly in the field by the drillers to avoid conflicts with utilities and existing landscaped features. The borings were drilled on September 18, 19 and 20, 2017 by Badger State Drilling (under subcontract to CGC) using an ATV-mounted D50 drill rig equipped with hollow-stem augers and an automatic SPT hammer. The boring locations are shown in plan on the Soil Boring Location Exhibit attached in Appendix B. Ground surface elevations at the boring locations were surveyed by R.A. Smith National.

In each boring, soil samples were obtained at 2.5 foot intervals to a depth of 10 ft and at 5 ft intervals thereafter. The soil samples were obtained in general accordance with specifications for standard penetration testing, ASTM D 1586. The specific procedures used for drilling and sampling are described below.

1. Boring Procedures between Samples

The boring is extended downward, between samples, by a hollow-stem auger.

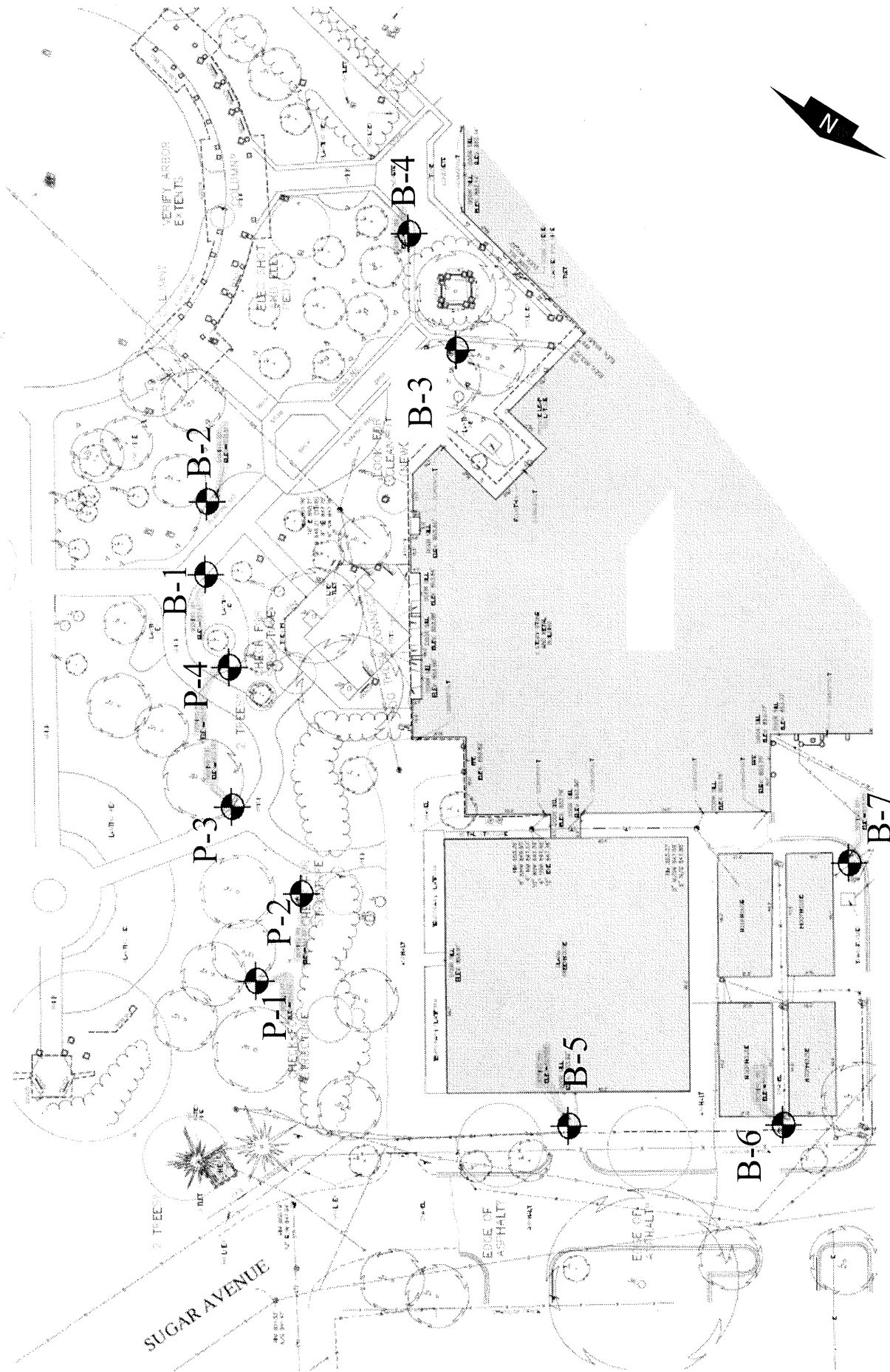
2. Standard Penetration Test and Split-Barrel Sampling of Soils
(ASTM Designation: D 1586)

This method consists of driving a 2-inch outside diameter split-barrel sampler using a 140-pound weight falling freely through a distance of 30 inches. The sampler is first seated 6 inches into the material to be sampled and then driven 12 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the log of borings and is known as the Standard Penetration Resistance.

During the field exploration, the driller visually classified the soil and prepared a field log. *Field screening of the soil samples for possible environmental contaminants was not conducted by the drillers as these services were not part of CGC's work scope.* Water level observations were made in each boring during and after drilling and are shown at the bottom of each boring log. Upon completion of drilling, the borings were backfilled with bentonite (where required) to satisfy WDNR regulations and the soil samples were delivered to our laboratory for visual classification and laboratory testing. The soils were visually classified by a geotechnical engineer using the Unified Soil Classification System. The final logs prepared by the engineer and a description of the Unified Soil Classification System are presented in Appendix B.

APPENDIX B

**SOIL BORING LOCATION EXHIBIT
LOGS OF TEST BORINGS (7)
SOIL BORING LOCATION EXHIBIT (2013)
LOGS OF TEST BORINGS (2013)
LOG OF TEST BORING – GENERAL NOTES
UNIFIED SOIL CLASSIFICATION SYSTEM**



Legend

⊙ Denotes Boring Location and Number.

Notes

1. Soil borings completed by Badger State Drilling September 18, 19 and 20, 2017.
2. Boring locations approximate.
3. Base map provided by City of Madison and R.A. Smith National.

Scale: Reduced

BORING LOCATION EXHIBIT Proposed Learning Center and Greenhouse Olbrich Gardens Madison, WI	
<div style="border: 1px solid black; border-radius: 15px; padding: 5px; display: inline-block;"> CGC, Inc. </div>	
Date: 9/2017	Job No.: C17051-22



LOG OF TEST BORING

Project Learning Center and Greenhouse
Olbrich Gardens
 Location Madison, WI

Boring No. B-1
 Surface Elevation (ft) 851.6
 Job No. C17051-22
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL
					13 in ± TOPSOIL FILL (OL)					
1		12	M	10	FILL: Very Stiff Brown Lean Clay, Little Sand and Organics	(2.5-3.0)				
2		14	M/W	13	FILL: Medium Dense, Brown Fine to Medium Sand, Trace Silt and Gravel					
3		18	M	3	Very Loose, Black Fibrous PEAT, Little Sand (PT)		209.0			61.2
4		10	W	4	Very Loose to Medium Dense, Grey Fine to Coarse SAND, Trace Silt, Little to Some Gravel (SP)					
5		18	W	10						
6		10	W	5						
7		8	W	15						
					End Boring at 20 ft					
					Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS

While Drilling ∇ 8.0' Upon Completion of Drilling _____
 Time After Drilling _____ 15 min.
 Depth to Water _____ 5.6' ∇
 Depth to Cave in _____ 5.6'

GENERAL NOTES

Start 9/18/17 End 9/18/17
 Driller BSD Chief KD Rig D-50
 Logger JB/DC Editor AJB
 Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project Learning Center and Greenhouse
Olbrich Gardens
 Location Madison, WI

Boring No. B-2
 Surface Elevation (ft) 850.8
 Job No. C17051-22
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	FINI Elev (in.)	Rec (in.)	Moist	N		Depth (ft)	q _u (qa) (tsf)	W	LL	PL
					11 in. ± TOPSOIL Fill (OL)					
1		10	M	7	FILL: Loose, Brown Fine to Medium Sand, Little Silt, Some Gravel					
2		18	M/W	6						
3		6	M	4	Very Loose, Brown to Black Sedimentary PEAT, Little Sand (PT)					
4		18	M	2			107.9			12.9
5		18	W	13	Medium Dense, Grey Fine to Coarse SAND, Trace Silt, Little Gravel (SP)					
6		6	W	11	Medium Dense, Light Brown to Gray Fine SAND, Trace to Little Silt, Trace Gravel (SP/SP-SM)					
7		4	W	12						
					End of Boring at 20 ft					
					Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS

While Drilling ∇ 11.0' Upon Completion of Drilling _____
 Time After Drilling _____ 15 min.
 Depth to Water _____ 4.5' ∇
 Depth to Cave in _____ 4.5'

GENERAL NOTES

Start 9/19/17 End 9/19/17
 Driller BSD Chief KD Rig D-50
 Logger DB Editor AJB
 Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project Learning Center and Greenhouse
Olbrich Gardens
 Location Madison, WI

Boring No. B-3
 Surface Elevation (ft) 852.7
 Job No. C17051-22
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qsa) (tsf)	W	LL	PL	LI
1	12	M	10	0-12	FILL: Loose, Dark Brown Organic Silt, Little Sand with Roots (Topsoil Fill)					
2	4	M	12	12-16	FILL: Coarse Aggregate (Driller's Description Based on Auger Cuttings) Very Loose to Medium Dense, Gray Fine to Medium SAND, Trace Silt and Gravel (SP - Possible Fill)					
3	10	M	15	16-26						
4	14	W	3	26-29						
5	12	W	2	29-31	Very Loose, Gray Fine to Medium SAND, Trace Silt and Gravel with Scattered Peat Seams/Layers (SP)					
6	10	W	11	31-42	Medium Dense, Gray Fine to Coarse SAND, Trace Silt, Little Gravel (SP)					
				42-44	Loose, Light Brown to Gray Fine SAND, Trace to Little Silt, Trace Gravel (SP/SP-SM)					
7	16	W	10	44-54						
					End Boring at 20 ft					
					Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS

While Drilling ∇ 8.0' Upon Completion of Drilling 7.9'
 Time After Drilling _____ 15 min.
 Depth to Water _____ 7.8' ∇
 Depth to Cave in _____ 8.1'

GENERAL NOTES

Start 9/18/17 End 9/18/17
 Driller BSD Chief KD Rig D-50
 Logger DB/DC Editor AJB
 Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project Learning Center and Greenhouse
Olbrich Gardens
 Location Madison, WI

Boring No. B-4
 Surface Elevation (ft) 851.6
 Job No. C17051-22
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
					13 in. ± TOPSOIL Fill (OL)					
1	14	M	8		FILL: Loose, Orangish-Brown Fine to Medium Sand, Trace to Little Silt, Little Gravel (Apparent Crushed Sandstone)					
2	8	M/W	2		FILL: Very Loose, Brown Fine to Medium Sand, Little Silt, Trace Gravel					
				5	Loose, Dark Brown to Black Sedimentary to Fibrous PEAT (PT)					
3	18	M	4							
4	18	M	4				174.3			26.5
5	18	W	6		Loose to Medium Dense, Grey Fine to Coarse SAND, Trace Silt and Gravel (SP)					
6	8	W	12							
7	6	W	10		Grades Fine in Sample 7 (18.5-20 ft)					
					End Boring at 20 ft					
					Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS

While Drilling ∇ 11.0' Upon Completion of Drilling 8.6'
 Time After Drilling _____ 15 min.
 Depth to Water _____ 7.7' ∇
 Depth to Cave in _____ 10.1'

GENERAL NOTES

Start 9/18/17 End 9/18/17
 Driller BSD Chief KD Rig D-50
 Logger DB/DC Editor AJB
 Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project Learning Center and Greenhouse
Olbrich Gardens
 Location Madison, WI

Boring No. B-5
 Surface Elevation (ft) 853.1
 Job No. C17051-22
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL
					3.5 in. Asphalt Pavement/6 in. Base Course					
1		10	M	21	FILL: Medium Dense, Orangish-Brown Fine to Medium Sand, Trace to Little Silt, Some Gravel (Apparent Crushed Sandstone)					
2		12	M	14						
3		18	W	16						
4		14	W	14						
5		18	W	9	Loose, Dark Gray Silty to Clayey Fine SAND, Thin Peat Seams (SM/SC)		17.1			1.1
6		18	W	18	Medium Dense, Light Brown to Gray Fine SAND, Trace to Little Silt, Trace Gravel (SP/SP-SM)					
7		18	W	19						
					End Boring at 20 ft					
					Borehole Backfilled with Bentonite Chips and Asphalt Patched					

WATER LEVEL OBSERVATIONS

While Drilling 6.0' Upon Completion of Drilling _____
 Time After Drilling _____ 15 min.
 Depth to Water _____ 8'
 Depth to Cave in _____ 8'

GENERAL NOTES

Start 9/20/17 End 9/20/17
 Driller BSD Chief KD Rig D-50
 Logger DB Editor AJB
 Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project Learning Center and Greenhouse
Olbrich Gardens
 Location Madison, WI

Boring No. B-6
 Surface Elevation (ft) 853.2
 Job No. C17051-22
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL
					6 in. ± Coarse Aggregate Fill (Driveway)					
1		10	M	12	FILL: Medium Dense, Orangish-Brown Fine to Medium Sand, Trace to Little Silt, Little Gravel (Apparent Crushed Sandstone)					
2		14	M	11						
3		10	W	19						
4		12	W	8	Medium Dense, Grey Firm to Medium SAND, Trace Silt and Gravel (SP)					
5		18	W	15						
6		10	W	11						
7		10	W	18						
					End Boring at 20 ft					
					Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS					GENERAL NOTES				
While Drilling	▽	6.0'	Upon Completion of Drilling		Start	9/20/17	End	9/20/17	
Time After Drilling				15 min.	Driller	BSD	Chief	KD	Rig D-50
Depth to Water				8'	Logger	DB	Editor	AJB	
Depth to Cave in				11'	Drill Method	2.25" HSA; Autohammer			
<small>The stratification lines represent the approximate boundary between soil types and the transition may be gradual.</small>									



LOG OF TEST BORING

Project Learning Center and Greenhouse
Olbrich Gardens
 Location Madison, WI

Boring No. B-7
 Surface Elevation (ft) 853.8
 Job No. C17051-22
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	qu (q _a) (tsf)	W	LL	PL
					7 in. ± TOPSOIL Fill (OL)					
1		14	M	22	FILL: Medium Dense, Brown Fine to Medium Sand, Little Silt, Some Gravel					
2		10	M	12	FILL: Medium Dense, Dark Brown to Black Mix of Clay, Sand, Gravel and Organics with Glass Pieces					
					5 Loose, Black Sedimentary PEAT (PT)					
3		10	M	5			62.2			14.5
4		10	W	8	Loose, Grey Fine to Medium SAND, Trace Silt and Gravel (SP)					
5		18	W	5	Soft to Medium Stiff, Dark Gray Lean CLAY, Trace Organics (CL)	(0.5)	22.2			2.3
6		10	W	9	Loose, Light Brown to Gray Fine SAND with Thin Silty Clayey Seams, Trace Gravel (SP/SP-SM)					
7		10	W	10	Grades Fine to Coarse in Sample 7 (18.5-20 ft)					
					20 End Boring at 20 ft Borehole Backfilled with Bentonite Chips					
					25					

WATER LEVEL OBSERVATIONS

While Drilling ∇ 8.5' Upon Completion of Drilling _____
 Time After Drilling _____ 15 min.
 Depth to Water _____ 8' ∇
 Depth to Cave in _____ 10'

GENERAL NOTES

Start 9/20/17 End 9/20/17
 Driller BSD Chief KD Rig D-50
 Logger DB Editor AJB
 Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project Learning Center and Greenhouse
Olbrich Gardens
 Location Madison, WI

Boring No. P1
 Surface Elevation (ft) 852.1
 Job No. C17051-22
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL
					11 in. ± TOPSOIL Fill (OL)					
1		18	M	12	FILL: Medium Dense, Light Brown/Gray Silty Fine Sand, Intermixed with Silt Seams USDA: 10YR 5/3, 4/2 Fine Sandy Loam and Silt Loam (FILL)					
2		6	M/W	9	FILL: Very Loose, Black and Light Gray Fine Sand, Little to Some Silt, Intermixed with Cinders USDA: 10YR 5/2, 2/1 Firm Loamy Sand and Cinders					
3		18	M/W	4	Very Loose to Loose, Dark Gray/Black Fibrous PEAT, Scattered Sand and Clay Seams (PT) USDA: 10YR 2/1, 3/2 Peat with Sand and Silty Clay Loam					
4		18	W	2	Very Loose, Dark Gray Sedimentary PEAT, Scattered Sand and Clay Seams (PT) USDA: 10YR 3/2 Peat with Sand and Silty Clay Loam					
5		18	W	16	Medium Dense, Light Gray/Light Brown Fine to Coarse SAND, Some Gravel, Trace to Little Silt (SP/SP-SM) USDA: 10YR 5/2, 5/3 Sand					
6		18	W	15						
					End Boring at 15 ft					
					Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS

While Drilling ∇ 8.5' Upon Completion of Drilling _____
 Time After Drilling _____ 15 min.
 Depth to Water _____ 7' ∇
 Depth to Cave in _____ 7'

GENERAL NOTES

Start 9/19/17 End 9/19/17
 Driller BSD Chief KD Rig D-50
 Logger DB Editor DAS
 Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project Learning Center and Greenhouse
Olbrich Gardens
 Location Madison, WI

Boring No. P2
 Surface Elevation (ft) 852.0
 Job No. C17051-22
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL
					0	12 in. ± TOPSOIL Fill (OL)				
1	█	12	M	5	5	FILL: Stiff, Dark Gray Silty to Lean Clay, Little to Some Sand, Scattered Gravel and Cobbles USDA: 10YR 3/1, 3/2 Silty Clay Loam (FILL)				
2	█	4	M	37	5	(-)				
3	█	18	M	6	5	Loose, Black Fibrous PEAT, Little Sand (PT) USDA: 10YR 2/1 PEAT				
4	█	18	W	8	10	Loose, Dark Gray/Black Fibrous PEAT, Scattered Sand and Clay Seams (PT) USDA: 10YR 2/1, 3/2 Peat with Sand and Silty Clay Loam				
5	█	18	W	18	10	Medium Dense, Dark Gray Fine to Medium SAND, Little Gravel, Trace to Little Silt, Scattered Peat and Clay Seams (SP/SP-SM) USDA: 10YR 4/1 Sand, with Peat and Silty Clay Loam				
6	█	18	W	17	15	Medium Dense, Light Brown Fine to Medium SAND, Some Gravel, Trace to Little Silt (SP/SP-SM) USDA: 10YR 5/3, Sand				
15						End Boring at 15 ft				
Borehole Backfilled with Bentonite Chips										
20										
25										

WATER LEVEL OBSERVATIONS					GENERAL NOTES				
While Drilling	▽	8.5'	Upon Completion of Drilling	_____	Start	9/19/17	End	9/19/17	
Time After Drilling		_____		15 min.	Driller	BSD	Chief	KD	Rig D-50
Depth to Water		_____		5' ▼	Logger	DB	Editor	DAS	
Depth to Cave in		_____		5'	Drill Method	2.25" HSA; Autohammer			
The stratification lines represent the approximate boundary between soil types and the transition may be gradual.									



LOG OF TEST BORING

Project Learning Center and Greenhouse
Olbrich Gardens
 Location Madison, WI

Boring No. P3
 Surface Elevation (ft) 853.1
 Job No. C17051-22
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL
					0	11 in. ± TOPSOIL Fill (OL)				
1	F	14	M	5	1	FILL: Very Stiff, Brown/Dark Gray Silty Clay, Intermixed with Sand <i>USDA: 10YR 3/1, 4/2 Silty Clay Loam</i>				
2	F	18	M/W	7	2	Loose, Gray Fine to Medium SAND, Some Silt, Scattered Thin Peat and lay Seams (SM - Possible Fill) <i>USDA: 10YR 5/1, 5/2 Sandy Loam with Peat and Silty Clay Loam</i>				
3	F	18	W	6	3	Loose, Gray Fine to Medium SAND, Little to Some Silt, Trace Shells and Fine Roots, Scattered Thin Silt and Peat Seams (SP-SM/SM) <i>USDA: 10YR 5/1, 5/2 Loamy Sand with Silt Loam and Peat Seams</i>				
4	F	18	W	4	4	Grades to Dark Gray (10YR 4/1) Near 10 ft				
5	F	18	W	17	5	Medium Dense, Dark Gray Fine to Coarse SAND, Trace Gravel, Trace to Little Silt (SP/SP-SM) <i>USDA: 10YR 4/1, Sand</i>				
6	F	18	W	18	6					
					15	End Boring at 15 ft Borehole Backfilled with Bentonite Chips				
					20					
					25					

WATER LEVEL OBSERVATIONS

While Drilling ∇ 8.5' Upon Completion of Drilling _____
 Time After Drilling _____ 15 min.
 Depth to Water _____ 7' ∇
 Depth to Cave in _____ 7'

GENERAL NOTES

Start 9/19/17 End 9/19/17
 Driller BSD Chief KD Rig D-50
 Logger DB Editor DAS
 Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

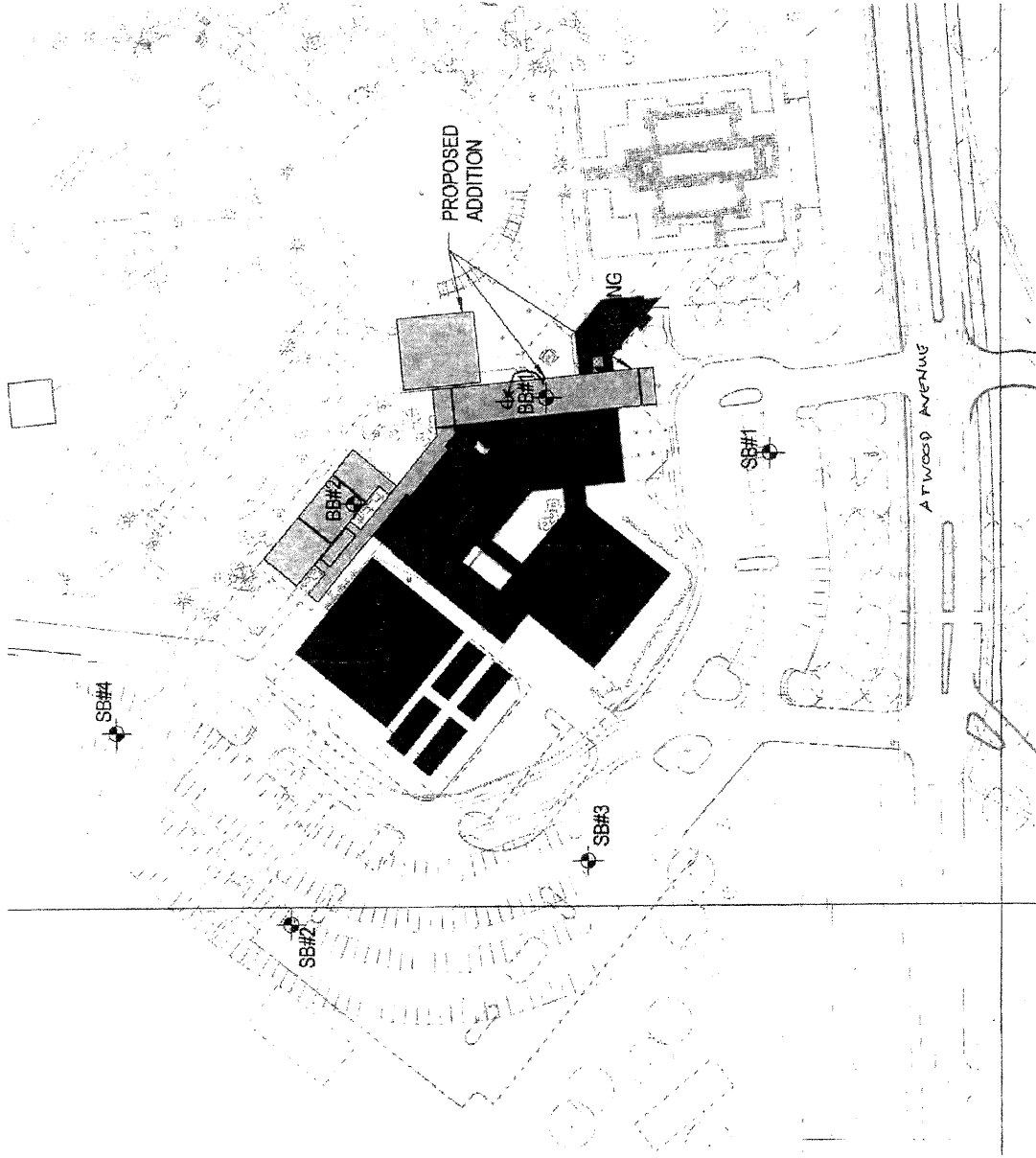
Project Learning Center and Greenhouse
Olbrich Gardens
 Location Madison, WI

Boring No. P4
 Surface Elevation (ft) 852.1
 Job No. C17051-22
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	q _u (qa) (tsf)	W	LL	PL
					0	12 in. ± TOPSOIL FILL (OL)				
1	█	14	M	6	6	FILL: Stiff to Very Stiff, Brown/Dark Gray Silty Clay, Intermixed with Sand and Topsoil USDA: 10YR 3/1, 4/2 Silty Clay Loam				
2	█	6	M	13	13	FILL: Loose, Light Brown Fine Sand, Little Silt and Gravel, Scattered Silt Seams/Pockets USDA: 10YR 5/3 Loamy Fine Sand, Scattered Silt Loam Seams				
3	█	12	M	4	17	Very Loose to Loose, Black Fibrous PEAT, Little Sand (PT) USDA: 10YR 2/1 PEAT				
4	█	14	W	6	23	Loose, Gray Fine to Coarse SAND, Trace to Little Silt and Gravel, Scattered Peat Seams (SP/SP-SM) USDA: 10YR 4/2 Sand, Scattered Peat Seams				
5	█	12	W	8	31	Loose to Medium Dense, Dark Gray Fine to Coarse SAND, Trace to Little Silt, Scattered Shells (SP/SP-SM) USDA: 10YR 4/2 Sand				
6	█	14	W	11	42	Scattered Thin Peat Seams Near 15 ft				
15						End Boring at 15 ft				
20						Borehole Backfilled with Bentonite Chips				
25										

WATER LEVEL OBSERVATIONS				GENERAL NOTES	
While Drilling	▽ 10.0'	Upon Completion of Drilling	7.5'	Start	9/18/17
Time After Drilling			15 min.	Driller	BSD Chief KD Rig D-50
Depth to Water			6' ▼	Logger	DB/DC Editor DAS
Depth to Cave in			6'	Drill Method	2.25" HSA; Autohammer
The stratification lines represent the approximate boundary between soil types and the transition may be gradual.					



Legend

☉ Denotes Recent Boring Location and Number

Notes

1. Soil borings performed by Soil Essentials, Ltd in June and July, 2013.
2. Boring locations are approximate.
3. Base map was provided by HGA.

Scale: Reduced

Date: 1/2013
Job No. C13064-5

CGC, Inc.

SOIL BORING LOCATION MAP
 Olbrich Botanical Gardens
 Renovation and Expansion
 Madison, Wisconsin



LOG OF TEST BORING

Project **Olbrich Botanical Gardens Renovation & Exp.**
 3330 Atwood Ave.
 Location **Madison, Wisconsin**

Boring No. **SB-1**
 Surface Elevation (ft) **96.7**
 Job No. **C13064-5**
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	FH Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
				3.5	X	3.5 in. Asphalt Pavement/9 in. Base Course				
1	10	M	16	4	[Grid Pattern]	FILL: Medium Dense, Light Brown Fine Sand, Trace Silt (SP)				
2	12	M	1	5	[Horizontal Lines]		148.6		47.2	
3	12	W	17	6	[Dotted]	Very Loose, Black Fibrous to Sedimentary PEAT (PT)				
4	14	W	3	10	[Diagonal Lines]	Medium Dense, Gray Fine to Medium SAND, Little to Some Silt (SP-SM/SM)				
5	10	W	11	15	[Dotted]	(0.25)	16.0			
				15	[Diagonal Lines]	Very Soft, Dark Gray to Black Slightly Organic/Lean CLAY (CL/OL)				
				15	[Dotted]	Medium Dense, Brown Fine to Medium SAND, Trace Silt and Gravel (SP)				
				15	End Boring at 15 ft					
				15	Borehole backfilled with bentonite and asphalt patch					

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling _____ Upon Completion of Drilling _____
 Time After Drilling _____ **1/2 hr** _____
 Depth to Water _____ **5.7'** _____
 Depth to Cave in _____

Start **6/7/13** End **6/7/13**
 Driller **SE** Chief **CRJ** Rig **GP**
 Logger **CRJ** Editor **WWW** **7822**
 Drill Method **2 1/4" HSA** **DT**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **Olbrich Botanical Gardens Renovation & Exp.**
 3330 Atwood Ave.
 Location **Madison, Wisconsin**

Boring No. **SB-2**
 Surface Elevation (ft) **96.6**
 Job No. **C13064-5**
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
				0	X	3.5 in. Asphalt Pavement/6 in. Base Course				
1	13	M	20	0	[Pattern]	FILL: Medium Dense, Brown Silty Fine Sand, Some Gravel with Cobbles and/or Boulders				
2	8	M	5	5	[Pattern]	Loose, Black Fibrous to Sedimentary PEAT (PT)				
3	13	M	7	5	[Pattern]	Loose, Gray-Brown Silty Fine SAND (SM), Occasional Clay Seams				
4	14	W	9	10	[Pattern]	Loose, Brown Fine SAND, Trace to Little Silt (SP/SP-SM)				
5	17	W	6	15	[Pattern]	End Boring at 15 ft				
Borehole backfilled with bentonite and asphalt patch										

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling _____ Upon Completion of Drilling _____
 Time After Drilling _____ **1/2 hr** _____
 Depth to Water _____ **5.7'** _____
 Depth to Cave in _____

Start **6/7/13** End **6/7/13**
 Driller **SE** Chief **CRJ** Rig **GP**
 Logger **CRJ** Editor **WWW** **7822**
 Drill Method **2 1/4" HSA** **DT**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **Olbrich Botanical Gardens Renovation & Exp.**
3330 Atwood Ave.
 Location **Madison, Wisconsin**

Boring No. **SB-3**
 Surface Elevation (ft) **99.6**
 Job No. **C13064-5**
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES									
No.	F H D M R (in.)	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	w	LL	PL	LI				
					X	3.5 in. Asphalt Pavement/7 in. Base Course									
1	8	M	8	8	X	FILL: Brown Silty Fine Sand, Trace Gravel (SM) Very Stiff to Hard, Greenish Gray Lean CLAY (CL)					(4.0)	18.1			
2	16	M	5	5	X	Stiff to Very Soft, Green/Gray (Mottled) Lean CLAY, Little Sand (CL)					(1.5)	17.9			
3	10	M	1	1	X	Grades Sandier with Depth					(0.1)				
4	15	W	11	11	X	Very Loose, Black Fibrous to Sedimentary PEAT (PT)									
					X	Medium Dense, Gray Fine to Medium SAND, Little to Some Silt (SP-SM/SM)									
					X	Medium Dense, Brown Fine to Medium SAND, Trace Silt and Gravel (SP)									
5	14	W	15	15	X	End Boring at 15 ft									
					X	Borehole backfilled with bentonite and asphalt patch									

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling _____ Upon Completion of Drilling _____
 Time After Drilling _____ **1/2 hr** _____
 Depth to Water _____ **6.9'** _____
 Depth to Cave in _____

Start **6/7/13** End **6/7/13**
 Driller **SE** Chief **CRJ** Rig **GP**
 Logger **CRJ** Editor **WWW** **7822**
 Drill Method **2 1/4" HSA** **DT**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **Olbrich Botanical Gardens Renovation & Exp.**
 3330 Atwood Ave.
 Location **Madison, Wisconsin**

Boring No. **SB-4**
 Surface Elevation (ft) **100.2**
 Job No. **C13064-5**
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
					FILL: Black Peat Mixed with Sand					
1	16	M	5							
2	16	M	22		FILL: Medium Dense, Brown Silty Fine Sand, Some Gravel with Cobbles and/or Boulders					
3	14	M	<1		Very Soft, Gray Silty CLAY (CL-ML)					
					Very Loose, Black Fibrous to Sedimentary PEAT (PT)	(0.25)				
4	17	M	5		Soft, Gray Lean CLAY with Organic Fibers (CL)	(0.25-0.5)	28.6			
					Medium Dense, Gray-Brown Fine to Medium SAND, Trace Silt (SP)					
5	17	W	12							
					End Boring at 15 ft					
					Borehole backfilled with bentonite and asphalt patch					

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling Upon Completion of Drilling _____
 Time After Drilling _____ 1/2 hr _____
 Depth to Water _____ 7.9'
 Depth to Cave in _____

Start **6/7/13** End **6/7/13**
 Driller **SE** Chief **CRJ** Rig **GP**
 Logger **CRJ** Editor **WWW** **7822**
 Drill Method **2 1/4" HSA** **DT**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **Olbrich Botanical Gardens Renovation & Exp.**
3330 Atwood Ave. 10'E of SE Corner of Building
 Location **Madison, Wisconsin**

Boring No. **BB-1**
 Surface Elevation (ft) **100.0**
 Job No. **C13064-5**
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	FB Rec (in.)	Moist	N	Depth (ft)		q _u (qa) (tsf)	W	LL	PL	LI
					FILL: Black Silty Topsoil (ML/OL)					
1	6	M	10		FILL: Yellow-Brown Fine to Medium SAND, Little Silt with Gravel-Sized Sandstone Fragments (Crushed Sandstone)					
2	10	M	18							
3	12	W	23							
4	14	M-W	18		FILL: Gray Silty/Clayey Fine to Medium Sand with Gravel (SM/SC) with Slight Petroleum Odor					
					Loose to Medium Dense, Gray Fine SAND, Trace to Little Silt and Gravel (SP/SP-SM)					
5	16	W	12							
6	18	W	11							
7	14	W	6							
End of Boring at 25 ft										
Borehole Backfilled with Bentonite Chips										

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling ∇ **6.5'** Upon Completion of Drilling _____
 Time After Drilling _____
 Depth to Water _____
 Depth to Cave in _____

Start **7/5/13** End **7/5/13**
 Driller **SE** Chief **DP** Rig **GP**
 Logger **DP** Editor **WWW** **7822**
 Drill Method **2 1/4" HSA** **DT**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **Olbrich Botanical Gardens Renovation & Exp.**
 3330 Atwood Ave.
 Location **Madison, Wisconsin**

Boring No. **BB-2**
 Surface Elevation (ft) **99.6**
 Job No. **C13064-5**
 Sheet **1 of 1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	DEPTH (ft)	Rec (in.)	Moist	N		Depth (ft)	q _u (tsf)	W	LL	PL
					FILL: Dark Brown Sandy Silt, Some Gravel					
1		10	M	16	FILL: Brown Fine to Medium Sand, Some Silt with Occasional Clay and Gravel Seams, Scattered Cobbles					
2		10	M	8						
3		7	M	21						
4		14	M	4	Very Loose, Black Fibrous to Sedimentary PEAT (PT)		341.1			73.0
					Loose to Medium Dense, Gray-Brown Fine to Medium SAND, Trace Silt (SP)					
5		14	W	7						
6		17	W	6						
7		16	W	13						
					End Boring at 25 ft					
					Borehole backfilled with bentonite chips					

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling Upon Completion of Drilling _____
 Time After Drilling _____ 1/2 hr _____
 Depth to Water _____ 7.9'
 Depth to Cave in _____

Start **6/7/13** End **6/7/13**
 Driller **SE** Chief **CRJ** Rig **GP**
 Logger **CRJ** Editor **WWW** **7822**
 Drill Method **2 1/4" HSA** **DT**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

LOG OF TEST BORING
General Notes

DESCRIPTIVE SOIL CLASSIFICATION

Grain Size Terminology

Soil Fraction	Particle Size	U.S. Standard Sieve Size
Boulders.....	Larger than 12"	Larger than 12"
Cobbles.....	3" to 12"	3" to 12"
Gravel: Coarse.....	¾" to 3"	¾" to 3"
Fine.....	4.76 mm to ¾"	#4 to ¾"
Sand: Coarse.....	2.00 mm to 4.76 mm	#10 to #4
Medium.....	0.42 to mm to 2.00 mm.....	#40 to #10
Fine.....	0.074 mm to 0.42 mm.....	#200 to #40
Silt.....	0.005 mm to 0.074 mm	Smaller than #200
Clay	Smaller than 0.005 mm	Smaller than #200

Plasticity characteristics differentiate between silt and clay.

General Terminology

Physical Characteristics
 Color, moisture, grain shape, fineness, etc.
 Major Constituents
 Clay, silt, sand, gravel
 Structure
 Laminated, varved, fibrous, stratified,
 cemented, fissured, etc.
 Geologic Origin
 Glacial, alluvial, eolian, residual, etc.

Relative Density

Term	"N" Value
Very Loose.....	0 - 4
Loose.....	4 - 10
Medium Dense.....	10 - 30
Dense.....	30 - 50
Very Dense.....	Over 50

Relative Proportions
 Of Cohesionless Soils

Proportional Term	Defining Range by Percentage of Weight
Trace.....	0% - 5%
Little	5% - 12%
Some	12% - 35%
And.....	35% - 50%

Consistency

Term	q _u -tons/sq. ft
Very Soft.....	0.0 to 0.25
Soft.....	0.25 to 0.50
Medium.....	0.50 to 1.0
Stiff.....	1.0 to 2.0
Very Stiff.....	2.0 to 4.0
Hard.....	Over 4.0

Organic Content by
 Combustion Method

Soil Description	Loss on Ignition
Non Organic.....	Less than 4%
Organic Silt/Clay.....	4 - 12%
Sedimentary Peat.....	12% - 50%
Fibrous and Woody Peat...	More than 50%

Plasticity

Term	Plastic Index
None to Slight.....	0 - 4
Slight.....	5 - 7
Medium.....	8 - 22
High to Very High ..	Over 22

The penetration resistance, N, is the summation of the number of blows required to effect two successive 6" penetrations of the 2" split-barrel sampler. The sampler is driven with a 140 lb. weight falling 30" and is seated to a depth of 6" before commencing the standard penetration test.

SYMBOLS

Drilling and Sampling

- CS – Continuous Sampling
- RC – Rock Coring: Size AW, BW, NW, 2"W
- RQD – Rock Quality Designation
- RB – Rock Bit/Roller Bit
- FT – Fish Tail
- DC – Drove Casing
- C – Casing: Size 2 ½", NW, 4", HW
- CW – Clear Water
- DM – Drilling Mud
- HSA – Hollow Stem Auger
- FA – Flight Auger
- HA – Hand Auger
- COA – Clean-Out Auger
- SS – 2" Dia. Split-Barrel Sample
- 2ST – 2" Dia. Thin-Walled Tube Sample
- 3ST – 3" Dia. Thin-Walled Tube Sample
- PT – 3" Dia. Piston Tube Sample
- AS – Auger Sample
- WS – Wash Sample
- PTS – Peat Sample
- PS – Pitcher Sample
- NR – No Recovery
- S – Sounding
- PMT – Borehole Pressuremeter Test
- VS – Vane Shear Test
- WPT – Water Pressure Test

Laboratory Tests

- q_a – Penetrometer Reading, tons/sq ft
- q_a – Unconfined Strength, tons/sq ft
- W – Moisture Content, %
- LL – Liquid Limit, %
- PL – Plastic Limit, %
- SL – Shrinkage Limit, %
- LI – Loss on Ignition
- D – Dry Unit Weight, lbs/cu ft
- pH – Measure of Soil Alkalinity or Acidity
- FS – Free Swell, %

Water Level Measurement

- ▽ - Water Level at Time Shown
- NW – No Water Encountered
- WD – While Drilling
- BCR – Before Casing Removal
- ACR – After Casing Removal
- CW – Cave and Wet
- CM – Caved and Moist

Note: Water level measurements shown on the boring logs represent conditions at the time indicated and may not reflect static levels, especially in cohesive soils.

CGC, Inc.

Madison - Milwaukee

Unified Soil Classification System

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS

(more than 50% of material is larger than No. 200 sieve size)

Clean Gravels (Less than 5% fines)



GW

Well-graded gravels, gravel-sand mixtures, little or no fines



GP

Poorly-graded gravels, gravel-sand mixtures, little or no fines

Gravels with fines (More than 12% fines)



GM

Silty gravels, gravel-sand-silt mixtures



GC

Clayey gravels, gravel-sand-clay mixtures

Clean Sands (Less than 5% fines)



SW

Well-graded sands, gravelly sands, little or no fines



SP

Poorly graded sands, gravelly sands, little or no fines

Sands with fines (More than 12% fines)



SM

Silty sands, sand-silt mixtures



SC

Clayey sands, sand-clay mixtures

FINE-GRAINED SOILS

(50% or more of material is smaller than No. 200 sieve size.)



ML

Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity



CL

Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays



OL

Organic silts and organic silty clays of low plasticity



MH

Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts



CH

Inorganic clays of high plasticity, fat clays



OH

Organic clays of medium to high plasticity, organic silts



PT

Peat and other highly organic soils

GRAVELS
More than 50% of coarse fraction larger than No. 4 sieve size

SANDS
50% or more of coarse fraction smaller than No. 4 sieve size

SILTS AND CLAYS
Liquid limit less than 50%

SILTS AND CLAYS
Liquid limit 50% or greater

HIGHLY ORGANIC SOILS

LABORATORY CLASSIFICATION CRITERIA

GW $C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3

GP Not meeting all gradation requirements for GW

GM Atterberg limits below "A" line or P.I. less than 4

Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols

GC Atterberg limits above "A" line or P.I. greater than 7

SW $C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3

SP Not meeting all gradation requirements for GW

SM Atterberg limits below "A" line or P.I. less than 4

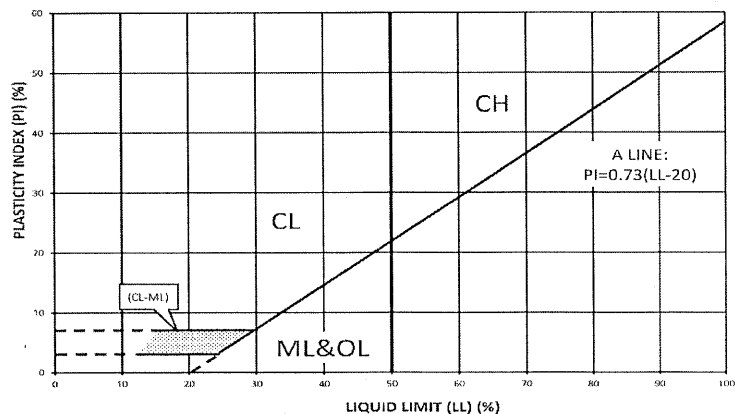
Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols

SC Atterberg limits above "A" line with P.I. greater than 7

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent GW, GP, SW, SP
More than 12 percent GM, GC, SM, SC
5 to 12 percent Borderline cases requiring dual symbols

PLASTICITY CHART



APPENDIX C

DOCUMENT QUALIFICATIONS

APPENDIX C DOCUMENT QUALIFICATIONS

I. GENERAL RECOMMENDATIONS/LIMITATIONS

CGC, Inc. should be provided the opportunity for a general review of the final design and specifications to confirm that earthwork and foundation requirements have been properly interpreted in the design and specifications. CGC should be retained to provide soil engineering services during excavation and subgrade preparation. This will allow us to observe that construction proceeds in compliance with the design concepts, specifications and recommendations, and also will allow design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction. CGC does not assume responsibility for compliance with the recommendations in this report unless we are retained to provide construction testing and observation services.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices and no other warranties are expressed or implied. The opinions and recommendations submitted in this report are based on interpretation of the subsurface information revealed by the test borings indicated on the location plan. The report does not reflect potential variations in subsurface conditions between or beyond these borings. Therefore, variations in soil conditions can be expected between the boring locations and fluctuations of groundwater levels may occur with time. The nature and extent of the variations may not become evident until construction.

II. IMPORTANT INFORMATION ABOUT YOUR 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 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 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 your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one - not even you* - should apply the 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.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

Geotechnical engineers consider a number of 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 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,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- 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. *CGC cannot accept responsibility or liability for problems that occur because our reports do not consider developments of which we 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; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the 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 OPINION

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 judgement 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 construction observation is the most

effective method of managing the risks associated with unanticipated conditions.

A REPORT'S RECOMMENDATIONS ARE NOT FINAL

Do not over-rely on the confirmation-dependent recommendations included in your report. *Those confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgement and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *CGC cannot assume responsibility or liability for the report's confirmation-dependent recommendations if we do 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 CGC 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 do not 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 engineer's 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 GEOTECHNICAL ENGINEER FOR ADDITIONAL ASSISTANCE

Membership in the Geotechnical Business Council (GBC) of 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 CGC, a member of GBC, for more information.

Modified and reprinted with permission from:

Geotechnical Business Council
of the Geoprofessional Business Association
8811 Colesville Road, Suite G 106
Silver Spring, MD 20910

APPENDIX D

RECOMMENDED COMPACTED FILL SPECIFICATIONS

APPENDIX D

CGC, INC.

RECOMMENDED COMPACTED FILL SPECIFICATIONS

General Fill Materials

Proposed fill shall contain no vegetation, roots, topsoil, peat, ash, wood or any other non-soil material which by decomposition might cause settlement. Also, fill shall never be placed while frozen or on frozen surfaces. Rock, stone or broken concrete greater than 6 in. in the largest dimension shall not be placed within 10 ft of the building area. Fill used greater than 10 ft beyond the building limits shall not contain rock, boulders or concrete pieces greater than a 2 sq ft area and shall not be placed within the final 2 ft of finish subgrade or in designated utility construction areas. Fill containing rock, boulders or concrete pieces should include sufficient finer material to fill voids among the larger fragments.

Special Fill Materials

In certain cases, special fill materials may be required for specific purposes, such as stabilizing subgrades, backfilling undercut excavations or filling behind retaining walls. For reference, WisDOT gradation specifications for various types of granular fill are attached in Table 1.

Placement Method

The approved fill shall be placed, spread and leveled in layers generally not exceeding 10 in. in thickness before compaction. The fill shall be placed at moisture content capable of achieving the desired compaction level. For clay soils or granular soils containing an appreciable amount of cohesive fines, moisture conditioning will likely be required.

It is the Contractor's responsibility to provide all necessary compaction equipment and other grading equipment that may be required to attain the specified compaction. Hand-guided vibratory or tamping compactors will be required whenever fill is placed adjacent to walls, footings, columns or in confined areas.

Compaction Specifications

Maximum dry density and optimum moisture content of the fill soil shall be determined in accordance with modified Proctor methods (ASTM D1557). The recommended field compaction as a percentage of the maximum dry density is shown in Table 2. Note that these compaction guidelines would generally not apply to coarse gravel/stone fill. Instead, a method specification would apply (e.g., compact in thin lifts with a vibratory compactor until no further consolidation is evident).

Testing Procedures

Representative samples of proposed fill shall be submitted to CGC, Inc. for optimum moisture-maximum density determination (ASTM D1557) prior to the start of fill placement. The sample size should be approximately 50 lb.

CGC, Inc. shall be retained to perform field density tests to determine the level of compaction being achieved in the fill. The tests shall generally be conducted on each lift at the beginning of fill placement and at a frequency mutually agreed upon by the project team for the remainder of the project.

**Table 1
Gradation of Special Fill Materials**

Material	WisDOT Section 311	WisDOT Section 312	WisDOT Section 305			WisDOT Section 209		WisDOT Section 210
	Breaker Run	Select Crushed Material	3-in. Dense Graded Base	1 1/4-in. Dense Graded Base	3/4-in. Dense Graded Base	Grade 1 Granular Backfill	Grade 2 Granular Backfill	Structure Backfill
Sieve Size	Percent Passing by Weight							
6 in.	100							
5 in.		90-100						
3 in.			90-100					100
1 1/2 in.		20-50	60-85					
1 1/4 in.				95-100				
1 in.					100			
3/4 in.			40-65	70-93	95-100			
3/8 in.				42-80	50-90			
No. 4			15-40	25-63	35-70	100 (2)	100 (2)	25-100
No. 10		0-10	10-30	16-48	15-55			
No. 40			5-20	8-28	10-35	75 (2)		
No. 100						15 (2)	30 (2)	
No. 200			2-12	2-12	5-15	8 (2)	15 (2)	15 (2)

Notes:

1. Reference: Wisconsin Department of Transportation *Standard Specifications for Highway and Structure Construction*.
2. Percentage applies to the material passing the No. 4 sieve, not the entire sample.
3. Per WisDOT specifications, both breaker run and select crushed material can include concrete that is 'substantially free of steel, building materials and other deleterious material'.

**Table 2
Compaction Guidelines**

Area	Percent Compaction (1)	
	Clay/Silt	Sand/Gravel
Within 10 ft of building lines		
Footing bearing soils	93 - 95	95
Under floors, steps and walks		
- Lightly loaded floor slab	90	90
- Heavily loaded floor slab and thicker fill zones	92	95
Beyond 10 ft of building lines		
Under walks and pavements		
- Less than 2 ft below subgrade	92	95
- Greater than 2 ft below subgrade	90	90
Landscaping	85	90

Notes:

1. Based on Modified Proctor Dry Density (ASTM D 1557)

APPENDIX E

**WISCONSIN DEPARTMENT OF SAFETY & PROFESSIONAL SERVICES
SOIL EVALUATION FORM**

SOIL EVALUATION - STORM

in accordance with Comm 82.365 & 85, Wis. Adm. Code

Attach complete site plan on paper not less than 8 1/2 x 11 inches in size. Plan must include, but not limited to: vertical and horizontal reference point (BM), direction and percent slope, scale or dimensions, north arrow, and BM referenced to nearest road.

Please print all information.

Personal information you provide may be used for secondary purposes (Privacy Law, s.15.04 (1) (m)).

County	Dane
Parcel I.D.	071008101041
Review by	Date

Property Owner City of Madison Parks Olbrich Botanical Gardens				Property Location Govt. Lot 1/4 1/4 S 08 T 07 N R 10 E Lot # Block # Subd. Name or CSM# 22 34 Fifth Addition to Fair Oaks			
Property Owner's Mailing Address 210 MLK JR Blvd, Rm 104							
City	State	Zip Code	Phone Number	<input checked="" type="checkbox"/> City	<input type="checkbox"/> Village	<input type="checkbox"/> Town	Nearest Road
Madison	WI	53703		Madison			3330 Atwood Avenue

Drainage area _____ sq. ft. _____ acres Optional: Test Site Suitable for (check all that apply) <input type="checkbox"/> Irrigation <input type="checkbox"/> Bioretention trench <input type="checkbox"/> Trench(es) <input type="checkbox"/> Rain Garden <input type="checkbox"/> Grassed Swale <input type="checkbox"/> Reuse <input type="checkbox"/> Infiltration trench <input type="checkbox"/> SDS (>15' wide) <input type="checkbox"/> Other _____	Hydraulic Application Test Method <input checked="" type="checkbox"/> Morphological Evaluation <input type="checkbox"/> Double-Ring Infiltrometer <input type="checkbox"/> Other (Specify) _____
---	--

P1 Obs. # Boring Pit Ground Surface Elev. 852.1 ft Depth to limiting factor 84 in.


Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frag.	Hydraulic App. Rate
									Inches/Hr
1	0 - 11		Topsoil - No Sample Collected		-	-	gs	<5	-
2	11 - 36	10 YR 5/3, 4/2	None	FSL/SiL (Fill)	Variable	Variable	gs	<5	0.13
3	36 - 60	10 YR 5/2, 2/1	None	FLS/Cinders (Fill)	Variable	Variable	gs	<5	0.5
4	60 - 96	10 YR 2/1, 3/2	None	Peat/S/SiCL	0m	mvfr	gs	<5	0.04
5	96 - 120	10 YR 3/2	None	Peat/S/SiCL	0m	mvfr	gs	<5	0.04
6	120 - 180	10 YR 5/2, 5/3	None	GRS	0sg	ml		15 - 35	3.6

Groundwater encountered in boring about 7 ft below existing grade

P2 Obs. # Boring Pit Ground Surface Elev. 852.0 ft Depth to limiting factor 66 in.

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frag.	Hydraulic App. Rate
									Inches/Hr
1	0 - 12		Topsoil - No Sample Collected		-	-	gs	<5	-
2	12 - 60	10 YR 3/1, 3/2	None	SiCL (Fill)	Variable	Variable	gs	<5	0.04
3	60 - 96	10 YR 2/1	None	Peat	0m	mvfr	gs	<5	0.04
4	96 - 126	10 YR 2/1, 3/2	None	Peat/S/SiCL	0m	mvfr	gs	<5	0.04
5	126 - 150	10 YR 4/1	None	S/Peat/SiCL	0sg	ml	gs	<5	0.04
6	150 - 180	10 YR 5/3	None	GRS	0sg	ml		15 - 35	3.6

Groundwater encountered in boring about 5 ft below existing grade.

CST/PSS Name (Please Print) DAVID A STAAB	Signature 	CST/PSS Number 1042602
Address 641 PIPER DRIVE, MADISON, WI	Date Evaluation Conducted 9/19/2017	Telephone Number 608/279-4530



Construction • Geotechnical
Consulting Engineering/Testing

February 15, 2018
C17051-54

Mr. Randy Wiesner
City of Madison, Department of Public Works
Engineering Division
City-County Building, Room 115
210 Martin Luther King Jr. Blvd
Madison, WI 53703

Re: Supplemental Geotechnical Exploration Report
Proposed Learning Center & Greenhouses
Olbrich Botanical Gardens
3201 Dairy Drive
Madison, Wisconsin

Dear Mr. Wiesner:

Construction • Geotechnical Consultants, Inc. (CGC) has completed the supplemental geotechnical exploration program for the proposed learning center and greenhouses at Olbrich Botanical Gardens. The purpose of this exploration program was to evaluate the deeper subsurface conditions within the planned construction area and to provide geotechnical recommendations regarding helical pier design and construction. We are sending you an electronic copy of this report and a paper copy can be provided upon request.

PROJECT DESCRIPTION AND SITE CONDITIONS

As described in the geotechnical report CGC prepared for this project (see Report C17051-22, dated October 4, 2017), we understand that a two-story learning center addition is proposed along the northeast side of the existing building, and replacement greenhouses are proposed northwest of the existing building. Although the buildings will be slab-on-grade (no basement), a 4,000 to 4,800-sq ft water storage cistern will be included below one of the buildings, although the location and other details are pending.

Although an undercutting/replacement alternative was completed below the existing building and discussed in our original report, we understand that the project team has concerns regarding potential costs and constructability of this approach (including dewatering and potential need to shore or underpin the existing building). Therefore, alternative foundation systems are being considered, specifically helical pier foundations. Since the soil borings completed for the initial geotechnical study were terminated at 20 ft, which were sufficient for the undercutting/replacement alternative but not for deep foundation analysis, four additional deeper borings (Borings 8 through 11) were performed within the planned building footprint to gather more information for helical pier design. Helical piers would likely support both compression and tension (uplift) loads depending on the location.

Mr. Randy Wiesner
City of Madison, Department of Public Works
February 15, 2018
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SUBSURFACE CONDITIONS

The supplemental study involved drilling four Standard Penetration Test (SPT) soil borings (labeled B-8 through B-11) to a planned depth of 75 ft below the ground surface. However, B-9 was extended to 85 ft to reach very dense soils, and B-11 was stopped at 65 ft after encountering very dense soils. The boring locations were selected by the project team and field-staked during a site meeting among City, CGC and Badger State Drilling personnel. The borings were drilled between January 30 and February 7, 2018 by Badger State Drilling (under subcontract to CGC) using an ATV-mounted D-50 rotary drill rig equipped with hollow-stem augers, mud rotary equipment and an automatic SPT hammer. The ground surface elevations at the boring locations were estimated by CGC using elevations at nearby previous borings, and the elevations should therefore be considered approximate. Specific procedures used for drilling and sampling are described in Appendix A, and the recent and previous boring locations are shown in plan on the Soil Boring Location Exhibit attached in Appendix B.

The subsurface profiles at the boring locations varied somewhat at shallow depths due to previous site development and grading, but the profiles were fairly similar with depth. The following strata were typically encountered (in descending order):

- About 14 to 18 in. of *topsoil fill* in B-8 and B-9, 3.25 in. of *asphalt*/8 in. of *sand/gravel base* in B-10, and 6 in. of *gravel fill* in B-11, over
- About 7 to 11.5 ft of *fill*, consisting primarily of loose to medium dense sand with variable sand and gravel contents, as well as occasional pockets of organic material, shells and cinders in some locations; note that a *dense asphalt layer* was encountered near 12 ft in B-8, underlain by
- 3.5 to 4 ft of very loose to loose *sedimentary peat* in B-10 and B-11, followed by
- Loose to very dense *sand* having variable silt and gravel contents, with a *very dense gravel layer* between about 43.5 and 47.5 ft in B-11. The density of the sand generally increased with depth.

A notable exception to the above profile includes 8 to 10-ft thick stiff to very stiff *lean clay* layers with thin fine sand seams between sand layers in B-8 and B-9. The clay layer was encountered between about 58 and 66 ft below grade in B-8 and between about 67.5 and 77.5 ft in B-9.

Groundwater was encountered in the borings during drilling at about 6 to 8.5 ft below site grades (corresponding to approximately EL 844 to 846.5 ft). The water levels were recorded before the drilling process was switched to mud/rotary drilling, which uses drilling mud to keep the borehole open when drilling below the water, but obscures water level readings at the completion of drilling.

Mr. Randy Wiesner
City of Madison, Department of Public Works
February 15, 2018
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Groundwater levels can be expected to fluctuate with seasonal variations in precipitation, infiltration, evapotranspiration, the level of nearby Lakes Mendota and Monona, the pumping rate of nearby wells and other factors. As a reference, the water level in Lake Monona is typically near EL 842 to 845 ft, and the water level in Lake Mendota is typically near EL 848 to 850 ft, so groundwater levels between the lakes are typically in the lake level range. A more detailed description of the site soil and groundwater conditions is presented on the Soil Boring Logs attached in Appendix B, which also contain the laboratory test results.

DISCUSSION AND HELICAL PIER RECOMMENDATIONS

Subject to the limitations discussed below and based on the subsurface exploration, it is our opinion that helical piers are a suitable foundation alternative for this project. *Note, however, that the relatively shallow asphalt layer in B-8 (or other potential obstructions in shallow fill soils) may require pre-drilling or overexcavation to permit helical pier installation. Additionally, gravel layers, such as the one encountered in B-11, will likely limit helical pier installation depth and therefore limit the pier capacity to what can be developed above this depth.* More detailed recommendations for helical pier design and construction are included in the following paragraphs. Additional information regarding the conclusions and recommendations presented in this report is discussed in Appendix C.

Helical Pier Foundations

In our opinion, the proposed buildings can be supported on helical piers that extend through the existing fill and organic soils and bear within the underlying medium dense to very dense sand layers. We recommend that the soil parameters included in Table 1 be used for helical pier design. *Soil stratigraphy and properties should be expected to vary across the site, as shown in the borings, which will affect helical pier installation depths to achieve a given capacity.*

Helical pier capacity will vary depending on the number and size of helices, depth of installation and bearing stratum. Utilizing the parameters summarized in Table 1, we used the commercially available software HeliCap®, produced by Hubbell Power Systems, to develop *preliminary* helical pier capacity estimates for a three-helix configuration (10 in., 12 in. and 14 in.) on a circular shaft. This program was developed to estimate the capacity for Chance® helical piers.

Using the software and the soil properties in Table 1, we estimate that *ultimate* helical pier capacities (in compression) of about 100 kips can be developed for 45 to 50-ft long helical piers (installed below existing) near Borings 8 and 9 (near the learning center), which is summarized in Table 2. Greater capacities can likely be developed if the piers extend to deeper, denser soils, but note that if the required installation torque corresponding to the required capacity is not achieved before the piers reach the clay layer near 58 to 67.5 ft, the installation torque (pier capacity) will likely decrease until the piers penetrate the clay layer and reach the underlying dense to very dense sand layer. Under this scenario, helical pier lengths of 75 to 80 ft will likely be required to develop *ultimate* pier

TABLE 1 - Soil Parameters for Analysis of Deep Foundations
Olbrich Gardens - Learning Center and Greenhouses
Madison, WI

Soil Layer		Generalized Profile						
		Fill: Very Loose to Loose Sand, Little Clay, Scattered Organic Pockets	Fill: Medium Dense Sand	Loose Sedimentary Peat	Loose to Medium Dense Sand	Dense Sand	Stiff to Very Stiff Lean Clay with Sand Seams	Very Dense & Very Dense to Dense Sand
Boring 8	Approximate Depth Below Existing Grade(1)	Not Encountered	1.5 to 13 ft	Not Encountered	13 to 48 ft	48 to 58 ft; 66 to 75 ft	58 to 66 ft	Not Encountered
Boring 9		1.2 to 8 ft	Not Encountered	8 to 11.5 ft	11.5 to 67.5 ft	Not Encountered	67.5 to 77.5 ft	77.5 to 85 ft
Boring 10		Not Encountered	1 to 11.5 ft	Not Encountered	11.5 to 37 ft	37 to 63 ft	Not Encountered	63 to 75 ft
Boring 11		0.5 to 8 ft	Not Encountered	8 to 12 ft	12 to 43 ft	43 to 65 ft	Not Encountered	-
Estimated Soil Parameters (2)								
	Angle of internal friction, ϕ	28	30	0	32	35	0	37
	Cohesion (psf)	0	0	10	0	0	2000	0
	Moist unit weight (pcf)	105	110	70	115	120	115	125
	Saturated Unit Weight (pcf)	110	115	90	120	125	120	130
	Submerged unit weight (pcf)	48	53	28	58	63	58	68
Earth pressure coefficients (2)								
	Active, K_a	0.36	0.33	1.0	0.31	0.27	1.0	0.25
	Passive, K_p	2.8	3.0	1.0	3.3	3.7	1.0	4.0
Sand Strata								
	Constant of subgrade reaction, k (pci) (2, 3)	20	60	-	60	125	-	125
Clay Strata								
	Subgrade modulus of reaction, k_h (pci) (constant with depth)	-	-	5 (static)	-	-	500 (static) 200 (cyclic)	-
L-Pile soil type		Sand	Sand	Soft Clay	Sand	Sand	Stiff Clay Without Free Water	Sand

Notes:

- (1) Depths have been generalized to some extent. Refer to boring logs for detailed descriptions at each location.
- (2) Values do not include a factor of safety (i.e., FS = 1.0)
- (3) Where $E_s = (k)(x)$ and x is the depth below ground surface.
- (4) N.R. = not recommended

Mr. Randy Wiesner
 City of Madison, Department of Public Works
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capacities of 100 to 120 kips. For this reason, it may be more economical to reduce the design capacity of the piers and install more, shorter piers rather than fewer, deeper piers. We anticipate that helical piers will encounter refusal shortly after reaching the very dense sand strata (near 77.5 ft below existing grade in Boring 9). Note that the helical pier capacity at these higher loads appears to be limited by the structural capacity of the helices and not from the geotechnical capacity of the soils; therefore, higher helical pier capacities may be possible with appropriate (heavier-duty) helical pier configurations installed in denser sand soils. *The helical pier depths and capacities should be considered approximate, and since helical piers are proprietary, the helical pier installer should determine the helix configuration and depth necessary to satisfy project requirements. Soil stratigraphy and properties should also be expected to vary across the site, which will also affect helical pier installation depths to achieve a given capacity.*

Table 2 – Preliminary Estimates of Helical Pier Depths

Boring	Approximate Depth Below Existing Grade (ft)	
	<i>Ultimate Capacity of 100 kips (Compression, kips)^{1,2}</i>	<i>Ultimate Capacity of 120 kips (Compression, kips)^{1,2}</i>
8	45	50 ⁽⁴⁾
9	50	85 ⁽⁴⁾
10	40	45
11	45	50

- Notes:**
1. The estimated helical pier depths to develop a given capacity were calculated using HeliCAP® v2.5.1 software, and the depths should be considered approximate. *Actual design depths should be determined by a separate, independent analysis using specific helix configurations proposed on the project.*
 2. Ultimate capacities do not include factor of safety (i.e., FS=1.0); appropriate factor of safety of 2 to 3, depending on level of load testing, should be applied to ultimate capacity to determine allowable capacity.
 3. Based on 14 in./12 in./10 in. helix configuration.
 4. Helical pier capacity will likely decrease as pier approaches clay layer near 58 ft (B-8) and 67.5 ft (B-9), so helical pier may need to be extended below clay layer to develop required capacity.

Mr. Randy Wiesner
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The soil profiles in Borings 10 and 11 were slightly different than Borings 8 and 9 since the clay layer was not encountered, but the relative density of the granular layer similarly increased with depth in these borings. Boring 11 also encountered an approximately 4-ft thick very dense gravel layer near 43.5 ft that may stop helical pier advancement; fortunately, the underlying granular soils are dense. From a design perspective, this gravel layer may be sporadic in location and thickness (as it was only encountered in one of the four deeper borings), so we have therefore assigned the same soil properties of the underlying dense sand to the very dense gravel layer. Based on the soil conditions in Borings 10 and 11 and estimated soil properties in Table 1, we estimate that *ultimate* helical pier capacities (in compression) of about 100 kips can be developed for 40 to 45-ft long helical piers (installed below existing), as summarized in Table 2. Greater capacities can likely be developed if the piers are extended to deeper denser soils.

The installation torque is generally correlated with helical pier capacity, although static load tests can also be completed to confirm the ultimate and allowable capacities. A minimum factor of safety of 2.0 to 3.0 is generally used for helical pier design. If a factor of safety of 2.0 is used to determine the allowable helical pier capacity, we recommend that at least one static load test be performed to confirm the helical pier design satisfies the project requirements. Static load tests should be performed on piers installed to similar installation depths and torques as production piers. (If the critical loading condition is in tension, tension load tests should be performed to document adequate uplift capacity.) Additionally, the torque of each pier should be monitored during installation to document that each pier is torqued to the minimum torque established by the static load tests or empirical correlations to the ultimate capacity. If static load tests are not performed, we recommend using a minimum factor of safety of 2.5 to 3.0 in determining the allowable capacity, and the installation torque of each pier should be monitored, which is empirically correlated to the ultimate capacity. *Since there are multiple proprietary helical pier systems, as well as different methods for estimating helical pier capacity, it is the responsibility of the contractor to determine that their selected helical pier configuration, installation procedures and termination criteria satisfy the project requirements.*

Other helical pier considerations include the following:

- *Prospective helical pier contractors should be aware of the presence of possible buried asphalt, gravel, cobbles, boulders, and other larger material within the surficial fill soils that may impact helical pier installation.* The helical pier installer should have provisions to deal with the presence of potential shallow obstructions. If obstructions are encountered, removing obstructions with an excavator would be one method to deal with the obstructions. Using smaller diameter helix configuration may also assist in the installation process but may require deeper piers to develop capacity.

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- The natural granular layers underlying the site have variable gravel content, including a very dense gravel layer near 43.5 ft, as well as potentially scattered cobbles and boulders that may affect helical pier installation. Helical piers may encounter refusal shortly after encountering the gravel layer, and adequate pier capacity may be developed under this scenario, since the underlying soils are also dense. However, if piers refuse on shallow cobbles, boulders or gravel layers within looser zones, a reduced capacity for the pier and/or additional piers may be needed to provide sufficient foundation support, which will need to be evaluated by the pier designer and structural engineer at the time of installation.
- The loose existing fill and organic soils have relatively low lateral capacity. As such, round helical pier shafts, which have higher resistance to buckling, are recommended over square shafts. A buckling analysis should be completed to check that the pier shaft has adequate buckling resistance.
- The organic layer present in several borings represents an increase in corrosion potential for the steel helical pier shafts. We therefore recommend that measures be taken to protect the helical pier shafts from corrosion, such as using a corrosion-resistant coating within the upper part of the shaft, or by increasing the thickness of the steel shafts to account for section loss due to corrosive soils. The final helical pier design should take into account the potentially corrosive nature of some of the soils at this site.
- Pile caps and grade beams along the perimeter of the building should be located a minimum of 4 ft below finish grade for frost protection.
- If a structure is partially supported on helical piers and partially on spread footings after undercutting/replacement of unsuitable soils, additional construction joints are recommended due to the potential for differential settlement between the different foundation support systems.
- We recommend that helical pier installation be monitored or contractor-prepared installation logs be reviewed by CGC.

Structural Floor Slab

In the original report CGC prepared for this project, it was expected that the non-engineered fill and highly organic peat soils would be completely undercut within (and slightly beyond) the building footprint. As such, the unsuitable soils would have been removed within floor slab areas in addition to below foundations, and a conventional slab-on-grade would be feasible. *Under a helical pier foundation support alternative where the non-engineered fill and peat will not be removed below slab areas, we recommend that the building floor slab consist of a structural slab supported on*



Mr. Randy Wiesner
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helical piers. We continue to recommend that a free-draining granular soil capillary break layer be included below the slab to reduce the risk of moisture migration through the slab, with a vapor barrier included where building codes require or where the risk of moisture migration through the slab is to be further reduced. We can provide additional information, if needed.

* * * * *

It has been a pleasure to serve you on this project. If you have any questions or need additional consultation, please contact us.

Sincerely,

CGC, Inc.

David A. Staab, P.E., LEED AP
Senior Consulting Professional

William W. Wuellner, P.E.
Senior Geotechnical Engineer

- Encl: Appendix A - Field Exploration
Appendix B - Soil Boring Location Exhibit
Log of Recent Test Borings (4)
Log of Test Boring-General Notes
Unified Soil Classification System
Appendix C - Document Qualifications

APPENDIX A

FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

The supplemental study involved drilling four Standard Penetration Test (SPT) soil borings (labeled B-8 through B-11) to a planned depth of 75 ft below the ground surface. However, B-9 was extended to 85 ft to reach very dense soils, and B-11 was stopped at 65 ft after encountering very dense soils. The boring locations were selected by the project team and field-staked during a site meeting between City, CGC and Badger State Drilling personnel. The borings were drilled between January 30 and February 7, 2018 by Badger State Drilling (under subcontract to CGC) using an ATV-mounted D-50 rotary drill rig equipped with hollow-stem augers, mud rotary equipment and an automatic SPT hammer. The ground surface elevations at the boring locations were estimated by CGC using elevations at nearby previous borings, and the elevations should therefore be considered approximate. The boring locations are shown in plan on the Soil Boring Location Exhibit attached in Appendix B.

In the previous borings, soil samples were obtained at 2.5-foot intervals to a depth of 10 ft and at 5 ft intervals thereafter. The soil samples were obtained in general accordance with specifications for standard penetration testing, ASTM D 1586. The specific procedures used for drilling and sampling are described below.

1. Boring Procedures between Samples

The boring is extended downward, between samples, by a hollow-stem auger.

2. Standard Penetration Test and Split-Barrel Sampling of Soils
(ASTM Designation: D 1586)

This method consists of driving a 2-inch outside diameter split-barrel sampler using a 140-pound weight falling freely through a distance of 30 inches. The sampler is first seated 6 inches into the material to be sampled and then driven 12 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the log of borings and is known as the Standard Penetration Resistance.

During the field exploration, the driller visually classified the soil and prepared a field log. *Field screening of the soil samples for possible environmental contaminants was not conducted by the drillers as environmental site assessment activities were not part of CGC's work scope.* Water level observations were made in each boring during and after drilling and are shown at the bottom of each boring log. Upon completion of drilling, the borings were backfilled with bentonite to satisfy WDNR regulations, and the soil samples were delivered to our laboratory for visual classification and laboratory testing. The soil samples were visually classified by a geotechnical engineer using the Unified Soil Classification System. The final logs prepared by the engineer, including laboratory test results, a boring location map, and a description of the Unified Soil Classification System are presented in Appendix B.

APPENDIX B

**SOIL BORING LOCATION EXHIBIT
LOGS OF TEST BORINGS (4)
LOG OF TEST BORING – GENERAL NOTES
UNIFIED SOIL CLASSIFICATION SYSTEM**



Legend


-  Denotes Recent Boring Location and Number
-  Denotes Previous Building Boring Location and Number

Notes

1. Recent soil borings drilled by Badger State Drilling between January 30 and February 7, 2018.
2. Site plan provided by City of Madison.
3. Boring locations are approximate.

Scale: See graphical scale



<p>Job No. C17051-54</p>		<p>SOIL BORING LOCATION EXHIBIT Olbrich Botanical Gardens Prop. Learning Center & Greenhouses 3330 Atwood Avenue Madison, WI</p>
<p>Date: 02/2018</p>		



LOG OF TEST BORING

Project Learning Center & Greenhouse - Supplemental
Olbrich Botanical Gardens
 Location Madison, WI

Boring No. 8
 Surface Elevation (ft) 852±
 Job No. C17051-54
 Sheet 1 of 2

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
1	16	M	15	5	18± in. Black Clayey TOPSOIL Fill (OL)					
2	14	M	15	5	FILL: Medium Dense, Orangish-Brown to White Fine to Sand, Little Silt, Trace Gravel (Apparent Crushed Sandstone)					
3	8	M	19	10						
4	9	W	14	10	FILL: Medium Dense, Gray Fine Sand, Little Silt and Clay, Trace Organics (Shells)					
5	3	W	35	15	Dense Layer Containing Asphalt Pavement Pieces Near About 12 ft					
6	12	W	5	15	Loose, Gray Fine SAND, Little Silt (SP-SM)					
7	18	W	26	20	Medium Dense to Dense, Light Brown to Gray Fine to Medium SAND, Trace to Little Silt, Trace Gravel (SP/SP-SM)					
8	18	W	30	25						
9	14	W	17	30						
10	16	W	19	35						
11	15	W	23	40						
12	16	W	20	45						
13	14	W	34	50						

WATER LEVEL OBSERVATIONS	GENERAL NOTES
While Drilling ∇ <u>8.0'</u> Upon Completion of Drilling _____ Time After Drilling _____ Depth to Water _____ ∇ Depth to Cave in _____	Start <u>1/30/18</u> End <u>1/30/18</u> Driller <u>BSD</u> Chief <u>DB</u> Rig <u>D-50</u> Logger <u>DC</u> Editor <u>AJB</u> Drill Method <u>2.25" HSA 0-10'; 3 7/8" RB/DM 10'-75'; Autohammer</u>
The stratification lines represent the approximate boundary between soil types and the transition may be gradual.	



LOG OF TEST BORING

Project Learning Center & Greenhouse - Supplemental
Olbrich Botanical Gardens
 Location Madison, WI

Boring No. 8
 Surface Elevation 852±
 Job No. C17051-54
 Sheet 2 of 2

2921 PERRY STREET, MADISON, WIS. 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					Depth (ft)	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	DEPTH (ft)	Rec (in.)	Moist	N			qu (qa) (tsf)	W	LL	PL	LI
14		18	W	40	55						
15		14	W	20	60	Stiff to Very Stiff, Gray Lean CLAY with Thin Silt and Fine Sand Seams (CL)	(1.5-2.0)				
16		6	W	18	65		(2.50)				
17		12	W	32	70	Dense, Light Brown Fine SAND, Little to Some Silt (SP-SM/SM)					
18		14	W	32	75						
End of Boring at 75 ft											
Backfilled with bentonite chips											
Note: Frost to about 2 ft											
					80						
					85						
					90						
					95						
					100						
					105						



LOG OF TEST BORING

Project Learning Center & Greenhouse - Supplemental
Olbrich Botanical Gardens
 Location Madison, WI

Boring No. 9
 Surface Elevation (ft) 851±
 Job No. C17051-54
 Sheet 1 of 2

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
1	18	M	8	0-5	14 in. Black Clayey TOPSOIL Fill (OL) FILL: Very Loose to Loose, Brown Fine Sand, Little Silt and Clay, Trace Organics (Shells) with Occasional Pockets of Peat					
2	18	M	8	5-10	Very Loose, Black Sedimentary PEAT, Little Sand (PT)					
3	12	W	4	10-15	Loose to Medium Dense, Gray Fine SAND, Little Silt (SP-SM)					
4	14	W	2	15-20	Gravelly Near About 20 ft					
5	12	W	10	20-25	Medium Dense, Light Brown to Gray Fine to Medium SAND, Trace to Little Silt, Trace Gravel (SP/SP-SM)					
6	1	W	15	25-30						
7	10	W	20	30-35						
8	14	W	18	35-40						
9	16	W	15	40-45						
10	18	W	17	45-50	Occasional Thin Silt Seams Below about 45 ft					
11	10	W	15							
12	18	W	18							

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling ∇ 6.0' Upon Completion of Drilling _____
 Time After Drilling _____
 Depth to Water _____ ∇
 Depth to Cave in _____

Start 1/30/18 End 1/30/18
 Driller BSD Chief DB Rig D-50
 Logger DC Editor AJB
 Drill Method 2.25" HSA 0-6'; 3 7/8"
RB/DM 6'-85'; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project Learning Center & Greenhouse - Supplemental
Olbrich Botanical Gardens
 Location Madison, WI

Boring No. 10
 Surface Elevation (ft) 853±
 Job No. C17051-54
 Sheet 1 of 2

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI	
1	6	M	41		3.25 in. Asphalt Pavement/8 in. Base Course FILL: Medium Dense to Dense, Brown to Yellowish-Brown to White Fine to Medium Sand, Little Silt, Trace Gravel (Apparent Crushed Sandstone) Medium Dense, Light Brown to Gray Fine to Coarse SAND, Trace to Little Silt, Trace Gravel (SP/SP-SM) Medium Dense, Gray Silty Fine SAND (SM) Medium Dense to Dense, Light Brown to Gray Fine to Medium SAND, Trace to Little Silt, Trace Gravel (SP/SP-SM)						
2	14	M	19	5							
3	4	M	12								
4	12	W	14	10							
5	14	W	16	15							
6	12	W	15	20							
7	14	W	20	25							
8	14	W	14	30							
9	14	W	16	35							
10	16	W	31	40							
11	14	W	33	45							
12	14	W	38	50							

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling ∇ 8.5' Upon Completion of Drilling _____
 Time After Drilling _____
 Depth to Water _____ ∇
 Depth to Cave in _____

Start 2/6/18 End 2/6/18
 Driller BSD Chief DB Rig D-50
 Logger DC Editor AJB
 Drill Method 2.25" HSA 0-10'; 3 7/8" RB/DM 10'-75'; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project Learning Center & Greenhouse - Supplemental
Olbrich Botanical Gardens
 Location Madison, WI

Boring No. 11
 Surface Elevation (ft) 854±
 Job No. C17051-54
 Sheet 1 of 2

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
1	0	M	50		6± in. Gravel Fill					
2	10	M	20		FILL: Mix of Gravel, Asphalt, Sand (Drillers Description - No Recovery)					
3	16	M	17		FILL: Medium Dense, Brown Fine to Coarse SAND, Some Gravel and Silt, Scattered Cinders					
4	18	W	4		FILL: Medium Dense, Brown Fine to Medium Sand, Some Silt and Gravel					
					Very Loose, Black Sedimentary PEAT, Sand (PT)					
5	5	W	15		Medium Dense, Gray Fine to Medium SAND, Trace Silt and Gravel (SP)					
6	12	W	23							
7	14	W	20							
8	14	W	28							
9	16	W	18		Medium Dense, Light Brown Fine SAND, Thin Silt/Clay Seams (SP-SM/SM)					
10	14	W	26							
11	2	W	50/2"		Dense to Very Dense, Gray Fine SAND, Some Silt and Gravel (SM) <i>Very Dense Gravelly Layer From About 43.5 to 47.5 ft</i>					
12	14	W	40							

WATER LEVEL OBSERVATIONS					GENERAL NOTES				
While Drilling	▽ 7.5'	Upon Completion of Drilling			Start	2/7/18	End	2/7/18	
Time After Drilling					Driller	BSD	Chief	DB	Rig D-50
Depth to Water				▼	Logger	DC	Editor	AJB	
Depth to Cave in					Drill Method	2.25" HSA; Autohammer			

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

LOG OF TEST BORING
General Notes

DESCRIPTIVE SOIL CLASSIFICATION

Grain Size Terminology

Soil Fraction	Particle Size	U.S. Standard Sieve Size
Boulders	Larger than 12"	Larger than 12"
Cobbles	3" to 12"	3" to 12"
Gravel: Coarse.....	¾" to 3"	¾" to 3"
Fine	4.76 mm to ¾"	#4 to ¾"
Sand: Coarse.....	2.00 mm to 4.76 mm.....	#10 to #4
Medium	0.42 to mm to 2.00 mm	#40 to #10
Fine	0.074 mm to 0.42 mm.....	#200 to #40
Silt.....	0.005 mm to 0.074 mm.....	Smaller than #200
Clay.....	Smaller than 0.005 mm.....	Smaller than #200

Plasticity characteristics differentiate between silt and clay.

General Terminology

Physical Characteristics
 Color, moisture, grain shape, fineness, etc.
Major Constituents
 Clay, silt, sand, gravel
Structure
 Laminated, varved, fibrous, stratified, cemented, fissured, etc.
Geologic Origin
 Glacial, alluvial, eolian, residual, etc.

Relative Density

Term "N" Value
 Very Loose..... . 0 - 4
 Loose..... 4 - 10
 Medium Dense.....10 - 30
 Dense.....30 - 50
 Very Dense.....Over 50

Relative Proportions Of Cohesionless Soils

Proportional Term	Defining Range by Percentage of Weight
Trace.....	0% - 5%
Little.....	5% - 12%
Some.....	12% - 35%
And	35% - 50%

Consistency

Term	q _u -tons/sq. ft
Very Soft.....	0.0 to 0.25
Soft.....	0.25 to 0.50
Medium.....	0.50 to 1.0
Stiff.....	1.0 to 2.0
Very Stiff.....	2.0 to 4.0
Hard.....	Over 4.0

Organic Content by Combustion Method

Soil Description	Loss on Ignition
Non Organic.....	Less than 4%
Organic Silt/Clay.....	4 - 12%
Sedimentary Peat.....	12% - 50%
Fibrous and Woody Peat...	More than 50%

Plasticity

Term	Plastic Index
None to Slight.....	0 - 4
Slight.....	5 - 7
Medium.....	8 - 22
High to Very High ..	Over 22

The penetration resistance, N, is the summation of the number of blows required to effect two successive 6" penetrations of the 2" split-barrel sampler. The sampler is driven with a 140 lb. weight falling 30" and is seated to a depth of 6" before commencing the standard penetration test.

SYMBOLS

Drilling and Sampling

- CS – Continuous Sampling
- RC – Rock Coring: Size AW, BW, NW, 2"W
- RQD – Rock Quality Designation
- RB – Rock Bit/Roller Bit
- FT – Fish Tail
- DC – Drove Casing
- C – Casing: Size 2 ½", NW, 4", HW
- CW – Clear Water
- DM – Drilling Mud
- HSA – Hollow Stem Auger
- FA – Flight Auger
- HA – Hand Auger
- COA – Clean-Out Auger
- SS - 2" Dia. Split-Barrel Sample
- 2ST – 2" Dia. Thin-Walled Tube Sample
- 3ST – 3" Dia. Thin-Walled Tube Sample
- PT – 3" Dia. Piston Tube Sample
- AS – Auger Sample
- WS – Wash Sample
- PTS – Peat Sample
- PS – Pitcher Sample
- NR – No Recovery
- S – Sounding
- PMT – Borehole Pressuremeter Test
- VS – Vane Shear Test
- WPT – Water Pressure Test

Laboratory Tests

- q_a – Penetrometer Reading, tons/sq ft
- q_a – Unconfined Strength, tons/sq ft
- W – Moisture Content, %
- LL – Liquid Limit, %
- PL – Plastic Limit, %
- SL – Shrinkage Limit, %
- LI – Loss on Ignition
- D – Dry Unit Weight, lbs/cu ft
- pH – Measure of Soil Alkalinity or Acidity
- FS – Free Swell, %

Water Level Measurement

- ▽ - Water Level at Time Shown
- NW – No Water Encountered
- WD – While Drilling
- BCR – Before Casing Removal
- ACR – After Casing Removal
- CW – Cave and Wet
- CM – Caved and Moist

Note: Water level measurements shown on the boring logs represent conditions at the time indicated and may not reflect static levels, especially in cohesive soils.

CGC, Inc.

Madison - Milwaukee

Unified Soil Classification System

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS

(more than 50% of material is larger than No. 200 sieve size)

Clean Gravels (Less than 5% fines)



GW

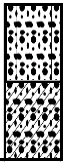
Well-graded gravels, gravel-sand mixtures, little or no fines



GP

Poorly-graded gravels, gravel-sand mixtures, little or no fines

Gravels with fines (More than 12% fines)



GM

Silty gravels, gravel-sand-silt mixtures



GC

Clayey gravels, gravel-sand-clay mixtures

GRAVELS
More than 50% of coarse fraction larger than No. 4 sieve size

Clean Sands (Less than 5% fines)



SW

Well-graded sands, gravelly sands, little or no fines



SP

Poorly graded sands, gravelly sands, little or no fines

Sands with fines (More than 12% fines)



SM

Silty sands, sand-silt mixtures



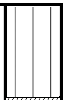
SC

Clayey sands, sand-clay mixtures

SANDS
50% or more of coarse fraction smaller than No. 4 sieve size

FINE-GRAINED SOILS

(50% or more of material is smaller than No. 200 sieve size.)



ML

Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity



CL

Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays



OL

Organic silts and organic silty clays of low plasticity



MH

Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts



CH

Inorganic clays of high plasticity, fat clays



OH

Organic clays of medium to high plasticity, organic silts



PT

Peat and other highly organic soils

SILTS AND CLAYS
Liquid limit less than 50%

SILTS AND CLAYS
Liquid limit 50% or greater

HIGHLY ORGANIC SOILS

LABORATORY CLASSIFICATION CRITERIA

GW $C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3

GP Not meeting all gradation requirements for GW

GM Atterberg limits below "A" line or P.I. less than 4

Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols

GC Atterberg limits above "A" line or P.I. greater than 7

SW $C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3

SP Not meeting all gradation requirements for GW

SM Atterberg limits below "A" line or P.I. less than 4

Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols

SC Atterberg limits above "A" line with P.I. greater than 7

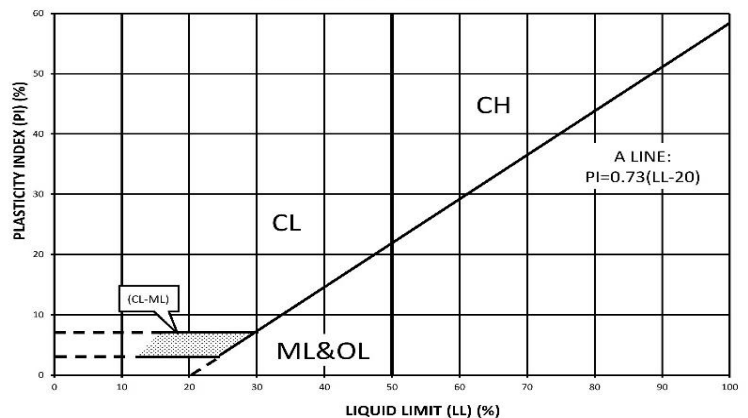
Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent GW, GP, SW, SP

More than 12 percent GM, GC, SM, SC

5 to 12 percent Borderline cases requiring dual symbols

PLASTICITY CHART



APPENDIX C

DOCUMENT QUALIFICATIONS

APPENDIX C

DOCUMENT QUALIFICATIONS

I. GENERAL RECOMMENDATIONS/LIMITATIONS

CGC, Inc. should be provided the opportunity for a general review of the final design and specifications to confirm that earthwork and foundation requirements have been properly interpreted in the design and specifications. CGC should be retained to provide soil engineering services during excavation and subgrade preparation. This will allow us to observe that construction proceeds in compliance with the design concepts, specifications and recommendations, and also will allow design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction. CGC does not assume responsibility for compliance with the recommendations in this report unless we are retained to provide construction testing and observation services.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices and no other warranties are expressed or implied. The opinions and recommendations submitted in this report are based on interpretation of the subsurface information revealed by the test borings indicated on the location plan. The report does not reflect potential variations in subsurface conditions between or beyond these borings. Therefore, variations in soil conditions can be expected between the boring locations and fluctuations of groundwater levels may occur with time. The nature and extent of the variations may not become evident until construction.

II. IMPORTANT INFORMATION ABOUT YOUR 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 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 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 your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one - not even you* - should apply the 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.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

Geotechnical engineers consider a number of 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 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,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- 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. *CGC cannot accept responsibility or liability for problems that occur because our reports do not consider developments of which we 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; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the 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 OPINION

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 judgement 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 construction observation is the most

effective method of managing the risks associated with unanticipated conditions.

A REPORT'S RECOMMENDATIONS ARE NOT FINAL

Do not over-rely on the confirmation-dependent recommendations included in your report. *Those confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgement and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *CGC cannot assume responsibility or liability for the report's confirmation-dependent recommendations if we do 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 CGC 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 do not 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 engineer's 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 GEOTECHNICAL ENGINEER FOR ADDITIONAL ASSISTANCE

Membership in the Geotechnical Business Council (GBC) of 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 CGC, a member of GBC, for more information.

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Geotechnical Business Council
of the Geoprofessional Business Association
8811 Colesville Road, Suite G 106
Silver Spring, MD 20910

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**SECTION 00 31 46
PERMITS**

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4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. REFERENCES 1
7 1.3. GENERAL CONTRACTORS RESPONSIBILITIES 1
8 1.4. OWNER RESPONSIBILITIES 1
9 PART 2 – PRODUCTS – THIS SECTION NOT USED 2
10 PART 3 – EXECUTION – THIS SECTION NOT USED 2
11

PART 1 – GENERAL

1.1. SUMMARY

- 15 A. Each project has varying requirements for permits, inspections, and fees based on the scope, size, and location of
16 the project.
17 B. The City of Madison (Owner) is subject to all permits, inspections and associated fees for construction,
18 demolition, utility connection, storm water management, and other similar requirements that may be required
19 to complete the scope of work associated with these contract documents.
20 C. The General Contractor (GC) shall be responsible for applying for all required permits and inspections necessary
21 to complete this contract.
22 D. The Owner, represented by the City Project Manager (CPM) or City Construction Manager (CCM) shall be
23 responsible paying for all application and inspection fees that may be required.
24

1.2. REFERENCES

- 26 A. The following references are not intended to be all inclusive. It shall be the GC’s responsibility to determine all
27 requirements based on the scope of work in the contract documents.
28 B. City of Madison Ordinances: Review all ordinances that may require a permit or fee that may be connected with
29 a required permit. **Contact the following City Agencies to determine the exact requirements during bidding**
30 1. Building Inspection
31 2. Zoning
32 3. Engineering
33 4. Water Utility
34 5. Traffic Engineering
35 6. Others as may be specified by the contract documents.
36 B. State Statutes
37 C. Other Regulatory Regulations
38 D. Other Agencies or companies that may have related requirements
39 1. Madison Metropolitan Sewerage District
40 2. Local gas and electric utility companies
41 3. Other utility companies
42

1.3. GENERAL CONTRACTORS RESPONSIBILITIES

- 44 A. The GC shall submit applications for all required permits as may be required by the scope of work described
45 within the contract documents. This includes but is not limited to permits to connect storm, sanitary and water;
46 land disturbing permits; occupation of right-of-way permits; hazardous waste removal permits; and other related
47 city, county, state, or federally required permit.
48 B. The GC shall be responsible for all applications, fees, and connection coordination, with private utility companies
49 including but not limited to electric, gas, cable, phone, etc. as may be required for this project.
50 C. The GC shall schedule all required inspections that may be conditions of any required permits regardless of
51 origin.
52 D. The GC shall provide high quality scanned images of all required permits and inspections and upload them to the
53 Contract Documents-Regulatory Documents Library on the Project Management Web Site.
54

1.4. OWNER RESPONSIBILITIES

- 56 A. The Owner, represented by the CPM or CCM, shall be responsible for all of the following:
57 1. Working with Engineering Accounting Team to obtain required Tyler Cashiering Codes for paying fees
58 through interagency billing.

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2. Working with Engineering Accounting Team to obtain required City checks for paying fees to non-city agencies.
 3. Working with other City Staff and the Engineering Accounting Team as needed to pay for fees that may be received through invoices from other non-city agencies.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

**SECTION 00 43 25
SUBSTITUTION REQUEST FORM (DURING BIDDING)**

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4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED SPECIFICATIONS 1
7 PART 2 – PRODUCTS – NOT USED 1
8 PART 3 - EXECUTION 1
9 3.1. REQUESTING A SUBSTITUTION DURING BIDDING 1
10 3.2. SUBMISSION REVIEW 2
11 3.3. SUBSTITUTION APPROVAL 2
12 3.4. SUBSTITUTION REQUEST FORM 3
13

PART 1 – GENERAL

1.1. SUMMARY

- 17 A. The City of Madison uses a specific list of preferred products for various specification items to establish
18 standards of quality, utility, and appearance required.
19 B. The City of Madison will only allow substitutions for specified Products BEFORE BIDDING if any of the following
20 are applicable:
21 1. The Product is no longer produced or the product manufacturer is no longer in business.
22 2. The manufacturer has significantly changed performance data, product dimensions, or other such design
23 criteria for the specified Product(s).
24 3. Product information specified includes “approved equal” or “approved equivalent” or similar language in
25 the specification.
26 a. Where product information does not include this language no substitutions will be considered.
27 C. The procedures in this specification shall apply to all proposals by Contractors, Suppliers, Vendors, and
28 Manufacturers when the conditions in item 1.1.B. above have been met during the bidding phase.
29

1.2. RELATED SPECIFICATIONS

- 30 A. 01 25 13 Product Substitution Procedures
31
32

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. REQUESTING A SUBSTITUTION DURING BIDDING

- 38 A. In the event that a substitution is requested during the bidding phase the Contractor, Supplier, Vendor, or
39 Manufacturer shall do all of the following:
40 1. Submit a Substitution Request Form for each different product. Use a printed/scanned copy of the form
41 at the end of this specification as a cover sheet.
42 2. Support your request with complete data, drawings, specifications, performance data and samples as
43 appropriate. A complete submission shall include the following:
44 a. Substitution Request Form as a cover sheet
45 b. Comparison of qualities of the proposed substitutions with that specified.
46 c. Changes required in other elements of the Work because of the substitution.
47 d. Effect on the construction schedule.
48 e. Cost data comparing the proposed substitution with the Product specified.
49 f. Any required license fees or royalties.
50 g. Availability of maintenance service and source of replacement materials.
51 3. Submit the Substitution Request Form and all required supporting documentation to the City Project
52 Manager and Project Architect.
53 a. Submissions to be done as complete PDF files for each product, appropriately titled
54 b. Email submissions to the Project Architect and City Project Manager at the email addresses
55 provided on the last page of Section D of the contract documents.
56 i. The subject line shall include the contract number and “Request for Substitution”.
57 Example: Contract 1234 – Request for Substitution

1 4. Submissions must be received by the substitution request deadline specified in Section A of the Contract
2 Documents.
3

4 **3.2. SUBMISSION REVIEW**

- 5 A. The Project Architect, City Project Manager, members of the design team, and the Owners staff shall review all
6 submissions for substitutions during the bidding phase.
7 B. Substitution requests WILL NOT be considered if any of the following are deemed applicable:
8 1. Requestor ignored conditions in Section 1.1.B. above.
9 2. Requestor did not provide sufficient information about the product.
10 3. Requestor did not email both the Project Architect and the City Project Manager the request.
11 4. Requestor missed the submittal deadline.
12

13 **3.3. SUBSTITUTION APPROVAL**

- 14 A. All requests for substitutions that have been approved shall be published by Addenda to the bid documents.
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17 **NOTE SEE NEXT PAGE FOR SAMPLE SUBSTITUTION REQUEST FORM.**
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3.4. SUBSTITUTION REQUEST FORM

For Pre-bid Substitution Requests all text boxes on this form are required information for a complete request.

	<h1>Substitution Request</h1>		
Today's Date:	<input type="text"/>		
Project Title:	<input type="text"/>		
Project Number:	<input type="text"/>	Contract Number:	<input type="text"/>
<p><i>By completing and submitting this form for review the General Contractor affirms that all of the following statements are correct:</i></p> <ol style="list-style-type: none"><i>The General Contractor affirms that this request is in compliance with the requirements described in Specification 01 25 13 Product Substitution Procedures.</i><i>The function, appearance, and quality of the proposed substitution are equal or superior to the specified item.</i><i>The proposed substitution does not affect dimensions shown on the drawings.</i><i>The proposed substitution will have no adverse affects on other trades, the construction schedule, or any specified warranty requirements.</i><i>Maintenance and service parts will be locally available for the proposed substitution. (GC shall provide supporting documentation in the attachments section below.)</i><i>The General Contractor shall be responsible for any and all costs associated with this substitution request if approved. This includes but is not to limited to fees for building design, engineering design fees, detailing fees, plan review fees, construction costs, and inspection fees.</i>			
<p style="text-align: center;"><u>GC Substitution Request:</u></p>			
General Title:	<input type="text"/>		
Related Specification:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Reason for Substitution:	<input type="text"/>		
Proposed Substitution: (include Name, Model, etc.)	<input type="text"/>		
Submitted By:	<input type="text"/>	Phone:	<input type="text"/>
Company:	<input type="text"/>	Email:	<input type="text"/>

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END OF SECTION

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**SECTION 00 43 43
WAGE RATES FORM**

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PART 1 – GENERAL 1
1.1. SUMMARY 1
1.2. RELATED SPECIFICATIONS 1
PART 2 – PRODUCTS – NOT USED 1
PART 3 - EXECUTION 1
3.1. GENERAL REQUIREMENTS..... 1
3.2. GENERAL CONTRACTORS RESPONSIBILITIES 1

PART 1 – GENERAL

1.1. SUMMARY

- A. The Reimbursable Hourly Worksheet is a contractor provided document that indicates the basic rate of pay, fringe benefits, and each companies cost of required insurance for all Trades and Classifications that will be performing productive labor during the execution of this contract.
 - 1. Rates shall be similar to recognized rates published by the Bureau of Labor Statistics, Associated General Contractors (AGC), Associated Builders and Contractors (ABC), appropriate union contracts, and other similar organizations or documents.
- B. The Reimbursable Labor Rate Worksheet shall provide the basis for labor rates being used on Change Order Request forms.

1.2. RELATED SPECIFICATIONS

- A. Section 01 26 57 Change Order Request
- B. Section 01 29 76 Progress Payment Procedures
- C. Section 01 31 23 Project Management Web Site (SharePoint)
- D. Section 01 32 19 Submittals Schedule

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. GENERAL REQUIREMENTS

- A. Prior to the Pre-Construction Meeting the City Project Manager (CPM) or the City Construction Manager (CCM) shall provide the GC a copy of the *Reimbursable Labor Rate Worksheet.xls*.
 - 1. See the last page of this specification for an example of the worksheet.
- B. The GC shall provide all subcontractors that will be performing productive labor during the execution of this contract with additional copies of the worksheet as needed.
- C. All contractors shall be required to fill out and submit completed worksheets for all Trades and Classifications of labor that will be performing productive labor during the execution of this contract.

3.2. GENERAL CONTRACTORS RESPONSIBILITIES

- A. The GC shall consolidate all Trades and Classifications into one master Excel Workbook of all trades.
- B. The GC shall provide the combined workbook as required by Section 1.6 of Specification 01 32 19 Submittals Schedule for review and approval by the Owners Representatives.
 - 1. Submittal shall be an Exported PDF of the completed Excel Workbook.
 - a. As an Exported PDF the individual worksheets will be bookmarked and the document will be word searchable for easy reference.
- C. The GC shall only use the rates posted in the approved submittal throughout the execution of this contract.

1
 2

Reimbursable Hourly Rate Worksheet

(see bottom of page for instructions)

Project Name: _____
 Project Location: _____
 Project Number: _____
 Contractor: _____
 Rates are based on the following documentation: _____

Enter TRADE Here:

Carpenter

<u>Classification:</u>		<u>Foreman</u>	<u>Journeyman</u>	<u>Laborer</u>	<u>Apprt 1</u>	<u>Other</u>	<u>Other</u>	<u>Other</u>
Base Rate (BR)		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Vacation		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Health Insurance		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Pension		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Apprenticeship		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<i>Sub-total</i>		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
BR Sub-total		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Work. Comp	% of BR	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Gen Liability	% of BR	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
WI Unemploy	% of BR	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Fed Unemploy	% of BR	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
FICA	% of BR	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<i>Sub-total</i>		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
TOTAL COST		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Enter YOUR percentage of base rate in the column below.

0	- Work. Comp
0	- Gen Liability
0	- WI Unemploy
0.6	- Fed Unemploy
7.65	- FICA

Form Instructions:

1. Provide a work sheet for ALL Trade Classifications that will be performing on site productive labor during the execution of this project.
2. Responsible contractor to complete only boxes that are shaded, all non-shaded boxes are formula driven.
3. Contractor shall provide the name of the source used for these rates. (union contract, Bureau of Labor and Statistics, AGC, ABC, etc.) and be prepared to provide copies if so requested.

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END OF SECTION

**SECTION 00 62 76.13
SALES TAX FORM**

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4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED SPECIFICATION SECTIONS 1
7 1.2. TAX EXEMPT FORM 1
8 PART 2 – PRODUCTS – THIS SECTION NOT USED 1
9 PART 3 – EXECUTION – THIS SECTION NOT USED 1

10
11 **PART 1 – GENERAL**

12
13 **1.1. SUMMARY**

- 14 A. The City of Madison is a qualifying tax exempt entity in the State of Wisconsin.
15 B. The Contractor shall refer to *Section 102.9 – Bidders Understanding of the City of Madison Standard*
16 *Specifications for Public Works Construction* for more information on Tax Exempt Status.
17 C. This project constructs or remodels facilities owned by the City of Madison in Madison, Wisconsin.
18

19 **1.2. RELATED SPECIFICATION SECTIONS**

- 20 A. Parts of this specification will reference articles within “The City of Madison Standard Specifications for Public
21 Works Construction”.
22 1. Use the following link to access the Standard Specifications web page:
23 <http://www.cityofmadison.com/business/pw/specs.cfm>
24 a. Click on the “Part” chapter identified in the specification text. For example if the specification
25 says “Refer to City of Madison Standard Specification 210.2” click the link for Part II, the Part II
26 PDF will open.
27 b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you
28 to the referenced text.
29

30 **1.3. TAX EXEMPT FORM**

- 31 A. The Contractor can access Wisconsin Sales and Use Tax Exemption Certificates (form S-211, Wisconsin
32 Department of Revenue) from the City of Madison Finance website.
33 1. City of Madison tax exempt information and signature by Purchasing Supervisor is already completed.
34 2. Website: <http://www.cityofmadison.com/employeeenet/finance/purchasing>
35 a. Under the title *Purchasing Forms*, scroll down to the form link titled *Sales Tax Exempt Form S-211*.
36

37 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

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39 **PART 3 – EXECUTION – THIS SECTION NOT USED**

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44 **END OF SECTION**
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**SECTION 01 25 13
PRODUCT SUBSTITUTION PROCEDURES (AFTER BIDDING)**

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4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED SPECIFICATIONS 1
7 PART 2 – PRODUCTS – NOT USED 1
8 PART 3 - EXECUTION 1
9 3.1. REQUESTING A SUBSTITUTION AFTER AWARD OF CONTRACT 1
10 3.2. SUBMISSION REVIEW 2
11 3.3. UNAUTHORIZED SUBSTITUTIONS..... 2
12 3.4. SUBSTITUTION REQUEST FORM..... 3
13

14 **PART 1 – GENERAL**

15
16 **1.1. SUMMARY**

- 17 A. The City of Madison uses a specific list of preferred products for various specification items to establish
18 standards of quality, utility, and appearance required.
19 B. The City of Madison will only allow substitutions for specified Products AFTER BIDDING if any of the following are
20 applicable:
21 1. The Product is no longer produced or the product manufacturer is no longer in business.
22 2. The manufacturer has significantly changed performance data, product dimensions, or other such design
23 criteria for the specified Product(s).
24 C. AFTER BIDDING, where Product information specified includes “approved equal” or “approved equivalent” or
25 similar language in the specification, the Contractor shall be restricted to the Product list provided in the
26 specification or pre-approved equals determined DURING BIDDING that were published in contract addenda.
27 D. Request for substitutions from any party other than the General Contractor (GC) will not be accepted.
28

29 **1.2. RELATED SPECIFICATIONS**

- 30 A. Section 01 26 13 Request for Information (RFI)
31 B. Section 01 31 23 Project Management Web Site (SharePoint)
32 C. Section 01 33 23 Submittals
33

34 **PART 2 – PRODUCTS – NOT USED**

35
36 **PART 3 - EXECUTION**

37
38 **3.1. REQUESTING A SUBSTITUTION AFTER AWARD OF CONTRACT**

- 39 A. A substitution request will only be considered after award of contract if it meets the qualifying provisions as
40 described in 1.1.B.1 and .2 above.
41 B. The GC shall submit a substitution request using the digital form on the Project Management Web Site
42 (SharePoint) located in the Construction Administration-Substitution Request library.
43 1. Click on *Add document* to open a new digital form
44 2. Fill out the form (general information is populated for you).
45 a. Support your request with complete data, drawings, specifications, performance data and
46 samples as appropriate. A complete submission shall include the following:
47 i. Substitution Request Form as a cover sheet
48 ii. Comparison of qualities of the proposed substitutions with that specified.
49 iii. Changes required in other elements of the Work because of the substitution.
50 iv. Effect on the construction schedule.
51 v. Cost data comparing the proposed substitution with the Product specified.
52 vi. Any required license fees or royalties.
53 vii. Availability of maintenance service and source of replacement materials.
54 b. All submissions shall be complete PDF files for each product.
55 3. Click the Submit button.
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3.2. SUBMISSION REVIEW

- A. The Project Architect, City Project Manager, members of the design team, and the Owners staff shall review all submissions for substitutions.
- B. Substitution requests WILL NOT be considered if any of the following are deemed applicable:
 - 1. Requestor ignored conditions in Section 1.1.B. above.
 - 2. Requestor did not provide sufficient information about the product.
- C. The Owner and Architect may reject any substitution request without providing specific reasons.

3.3. UNAUTHORIZED SUBSTITUTIONS

- A. Any Contractor who substitutes products without proper authorization by the Owner and Architect will be required to immediately remove and replace the product and all costs required to conform to the Contract Documents shall be borne by the General Prime Contractor.

NOTE SEE NEXT PAGE FOR SAMPLE SUBSTITUTION REQUEST FORM.

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3.4. SUBSTITUTION REQUEST FORM

For Pre-bid Substitution Requests all text boxes on this form are required information for a complete request.

	<h1>Substitution Request</h1>		
Today's Date:	<input type="text"/>		
Project Title:	<input type="text"/>		
Project Number:	<input type="text"/>	Contract Number:	<input type="text"/>
<p>By completing and submitting this form for review the General Contractor affirms that all of the following statements are correct:</p> <ol style="list-style-type: none">1 The General Contractor affirms that this request is in compliance with the requirements described in <i>Specification 01 25 13 Product Substitution Procedures</i>.2 The function, appearance, and quality of the proposed substitution are equal or superior to the specified item.3 The proposed substitution does not affect dimensions shown on the drawings.4 The proposed substitution will have no adverse affects on other trades, the construction schedule, or any specified warranty requirements.5 Maintenance and service parts will be locally available for the proposed substitution. (GC shall provide supporting documentation in the attachments section below.)6 The General Contractor shall be responsible for any and all costs associated with this substitution request if approved. This includes but is not to limited to fees for building design, engineering design fees, detailing fees, plan review fees, construction costs, and inspection fees.			
GC Substitution Request:			
General Title:	<input type="text"/>		
Related Specification:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Reason for Substitution:	<input type="text"/>		
Proposed Substitution: (include Name, Model, etc.)	<input type="text"/>		
Submitted By:	<input type="text"/>	Phone:	<input type="text"/>
Company:	<input type="text"/>	Email:	<input type="text"/>

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**SECTION 01 25 13
PRODUCT SUBSTITUTION PROCEDURES**

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4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED SPECIFICATIONS 1
7 PART 2 – PRODUCTS..... 1
8 2.1. SUBSTITUTION REQUEST FORM..... 1
9 PART 3 - EXECUTION 1
10 3.1. REQUESTING A SUBSTITUTION DURING BIDDING..... 1
11 3.2. REQUESTING A SUBSTITUTION AFTER AWARD OF CONTRACT 2
12 3.3. UNAUTHORIZED SUBSTITUTIONS..... 2
13

PART 1 – GENERAL

1.1. SUMMARY

- 17 A. The City of Madison uses a specific list of preferred products for various specification items to establish
18 standards of quality, utility, and appearance required.
19 B. The City of Madison will not allow substitutions for specified Products except as follows:
20 1. The Product is no longer produced or the product manufacturer is no longer in business.
21 2. The manufacturer has significantly changed performance data, product dimensions, or other such design
22 criteria for the specified Product(s).
23 3. Products specified by naming one or more Products or manufacturer’s and “or approved equal” or
24 “approved equivalent.”
25 C. The City of Madison will not allow substitutions for specified Products as follows:
26 1. For Products specified by naming only one Product and manufacturer, no substitute product will be
27 considered.
28 2. For Products specified by naming several Products or manufacturers select any one of the products or
29 manufacturers named, which complies with the specifications. No substitute product will be considered.
30 D. Request for substitutions from any party other than the General Contractor (GC) will not be accepted.
31

1.2. RELATED SPECIFICATIONS

- 33 A. Section 01 26 13 Request for Information (RFI)
34 B. Section 01 31 23 Project Management Web Site (SharePoint)
35 C. Section 01 33 23 Submittals
36

PART 2 – PRODUCTS

2.1. SUBSTITUTION REQUEST FORM

- 40 A. During bidding all contractors (General and Sub-contractors) and suppliers of materials or products shall provide
41 hard copy of the Substitution Request form and all required attachments directly to the Project Architect.
42 1. Contractors and suppliers shall use the screen shot of the form located at the end of this specification to
43 print a hard copy for all pre-bid substitution requests.
44 B. After bidding only the GC shall submit a request and shall use the form located on the Project Management Web
45 Site.
46

PART 3 - EXECUTION

3.1. REQUESTING A SUBSTITUTION DURING BIDDING

- 50 A. In the event that a substitution is requested during the bidding phase the Contractor or Supplier shall meet the
51 substitution request deadline listed in the bidding documents. No substitution request will be considered during
52 the bidding period after the stated substitution request deadline. In general this procedure shall be as follows:
53 1. Submit a Substitution Request Form for each different product
54 2. Support your request with complete data, drawings, specifications, performance data and samples as
55 appropriate. A complete submission shall include the following:
56 i. Substitution Request Form as a cover sheet
57 ii. Comparison of qualities of the proposed substitutions with that specified.
58 iii. Changes required in other elements of the Work because of the substitution.

1

For Pre-bid Substitution Requests all text boxes on this form are required information for a complete request.

	<h1>Substitution Request</h1>
Today's Date:	<input type="text"/>
Project Title:	<input type="text"/>
Project Number:	<input type="text"/>
Contract Number:	<input type="text"/>
<p>By completing and submitting this form for review the General Contractor affirms that all of the following statements are correct:</p> <ol style="list-style-type: none">1 The General Contractor affirms that this request is in compliance with the requirements described in <i>Specification 01 25 13 Product Substitution Procedures</i>.2 The function, appearance, and quality of the proposed substitution are equal or superior to the specified item.3 The proposed substitution does not affect dimensions shown on the drawings.4 The proposed substitution will have no adverse affects on other trades, the construction schedule, or any specified warranty requirements.5 Maintenance and service parts will be locally available for the proposed substitution. (GC shall provide supporting documentation in the attachments section below.)6 The General Contractor shall be responsible for any and all costs associated with this substitution request if approved. This includes but is not limited to fees for building design, engineering design fees, detailing fees, plan review fees, construction costs, and inspection fees.	
GC Substitution Request:	
General Title:	<input type="text"/>
Related Specification:	<input type="text"/> <input type="text"/> <input type="text"/>
Reason for Substitution:	<input type="text"/>
Proposed Substitution: (include Name, Model, etc.)	<input type="text"/>
Submitted By:	<input type="text"/>
Company:	<input type="text"/>
Phone:	<input type="text"/>
Email:	<input type="text"/>

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**SECTION 01 26 13
REQUEST FOR INFORMATION (RFI)**

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4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED SPECIFICATIONS 1
7 1.3. PERFORMANCE REQUIREMENTS..... 1
8 1.4. QUALITY ASSURANCE 1
9 PART 2 – PRODUCTS – NOT USED 1
10 PART 3 - EXECUTION 1
11 3.1. HOW TO INITIATE AN RFI 1
12 3.3. RFI RESPONSES..... 2
13 3.4. COMMENCEMENT OF WORK RELATED TO AN RFI..... 2
14

PART 1 – GENERAL

1.1. SUMMARY

- 18 A. Contractors shall use the RFI form/process to request additional information or clarification regarding the
19 construction documents.
20 B. All RFI documentation will be processed through the Construction Administration-Request for Information
21 Library on the Project Management Web Site (SharePoint).
22

1.2. RELATED SPECIFICATIONS

- 23 A. Section 01 26 46 Construction Bulletin (CB)
24 B. Section 01 26 57 Change Order Request (COR)
25 C. Section 01 26 63 Change Order (CO)
26 D. Section 01 31 23 Project Management Web Site (SharePoint)
27 E. Section 01 91 00 Commissioning
28
29

1.3. PERFORMANCE REQUIREMENTS

- 30 A. RFI issues initiated by any contractor shall be done through the General Contractor (GC).
31 1. RFIs submitted by any Sub-contractor under the GCs control shall be returned with no response.
32 B. Submit a new RFI for each issue. Only multiple questions that are of a similar nature may be combined into one
33 RFI shall be allowed and responded to.
34
35

1.4. QUALITY ASSURANCE

- 36 A. The GC shall be responsible for all of the following:
37 1. Ensure that any request for additional information is valid and the information being requested is not
38 addressed in the construction documents.
39 2. Ensure that all requests are clearly stated and the RFI form is completely filled out.
40 3. Ensure that all Work associated with an RFI response is carried out as intended.
41 B. The PA shall be responsible for the following:
42 1. Ensure that all responses to contractor initiated RFIs are properly responded to in a timely fashion.
43 a. The City Project Manager (CPM), City construction Manager (CCM), Owner, consulting staff, and
44 other City staff shall be responsible for the initial review of the RFI. The Project Architect (PA)
45 shall be responsible for codifying all consultant and Owner/City staff comments into a unified RFI
46 response.
47
48

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. HOW TO INITIATE AN RFI

- 54 A. Immediately on discovery of the need for additional information or interpretation of the Contract Documents
55 any contractor may initiate an RFI for additional information or clarification through the GC.
56 B. The GC shall initiate an RFI form in the Construction Administration - Request for Information Library on the
57 Project Management Web Site (SharePoint).
58 1. The GC shall select the "Add Document" link in the RFI Library and completely fill out the form as follows:

- 1 a. Contract related information is automatically populated on the form when it is initiated.
- 2 b. Thoroughly explain the issue at hand, provide backup information (photographs, sketches,
- 3 drawings, data, etc.) as necessary, and clearly state the question or problem that requires a
- 4 resolution. Combine like or related issues but do not include multiple issues on one form.
- 5 i. Example. If a duct interferes with other critical piping and electrical work include all
- 6 issues into one RFI.
- 7 ii. Example. If you have a question regarding the chiller and another regarding toilet
- 8 partitions create separate RFIs.
- 9 2. Check all relevant boxes for trades affected. This will assist the design team in determining who should
- 10 be reviewing the RFI.
- 11 3. Upon completing the RFI click the "Submit" button. The SharePoint software will automatically route the
- 12 RFI to the appropriate reviewers.
- 13

14 **3.3. RFI RESPONSES**

- 15 A. The City of Madison's goal for the RFI review process is 7 working days of the completed RFI form being
- 16 submitted.
- 17 1. Responses to more complex issues may require additional time or may require a Construction Bulletin to
- 18 be published.
- 19 2. If a CB is required the initial RFI shall be responded to within 7 working days stating that the RFI is being
- 20 reviewed, a CB will be written, and an estimated date for the CB will be provided.
- 21 B. The following GC generated RFIs will be returned without action:
- 22 1. Requests for approval of submittals
- 23 2. Requests for approval of substitutions
- 24 a. Communicate directly with CPM/CCM via email or phone call.
- 25 3. Requests for approval of Contractor's means and methods.
- 26 4. Requests for coordination information already indicated in the Contract Documents.
- 27 5. Requests for adjustments in the Contract Time or the Contract Sum.
- 28 a. Communicate directly with CPM/CCM via email or phone call.
- 29 6. Requests for interpretation of PA's actions on submittals.
- 30 a. Communicate directly with PA for via email or phone call.
- 31 7. Incomplete RFI or inaccurately prepared RFI.
- 32 a. Communicate directly with PA via email or phone call.
- 33

34 **3.4. COMMENCEMENT OF WORK RELATED TO AN RFI**

- 35 A. The GC shall only proceed with the Work of an RFI when additional information is not required.
- 36 B. The GC shall not proceed with any Work associated with an RFI while it is under review.
- 37 C. The GC shall not proceed with any Work associated with an RFI that clearly states a CB will be issued in response
- 38 to the RFI.
- 39 D. The GC will be required to immediately remove and replace unauthorized Work and all costs required to
- 40 conform to the Contract Documents shall be borne by the GC.
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END OF SECTION

**SECTION 01 26 46
CONSTRUCTION BULLETIN (CB)**

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4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED SPECIFICATIONS 1
7 1.3. PERFORMANCE REQUIREMENTS..... 1
8 1.4. QUALITY ASSURANCE 2
9 PART 2 – PRODUCTS – NOT USED 2
10 PART 3 - EXECUTION 2
11 3.1. WRITING THE CONSTRUCTION BULLETIN 2
12 3.2. EXECUTING THE CONSTRUCTION BULLETIN..... 2
13

PART 1 – GENERAL

1.1. SUMMARY

- 17 A. Construction Bulletins (CB) are formal published construction documents that modify the original contract bid
18 documents after construction has commenced. CBs may be published for many reasons, including but not
19 limited to the following:
20 1. Clarification of existing construction documents including specifications, plans, and details
21 2. Change in product or equipment
22 3. A response to a Request for Information
23 4. Change in scope of the contract as either an add or a deduct of work
24 B. CBs provide a higher degree of detail in response to a Request for Information (RFI) through directives, revised
25 plans/details, and specifications as necessary.
26 C. The CB may change the original contract documents through additions or deletions to the Work.
27 D. Where the directives of a CB are significant enough to warrant a Change Order Request (COR) the GC shall use all
28 information provided in the CB to assemble all required back-up documentation for additions and deletions of
29 materials, labor and other related contract costs for the COR.
30 E. All CB documentation will be processed through the Construction Administration-Construction Bulletin Library
31 on the Project Management Web Site (SharePoint).
32

1.2. RELATED SPECIFICATIONS

- 34 A. Section 01 26 13 Request for Information (RFI)
35 B. Section 01 26 57 Change Order Request (COR)
36 C. Section 01 26 63 Change Order (CO)
37 D. Section 01 31 23 Project Management Web Site (SharePoint)
38 E. Section 01 91 00 Commissioning
39

1.3. PERFORMANCE REQUIREMENTS

- 41 A. Project Architect (PA): The PA shall be the only person authorized to publish a CB as needed for any reason
42 indicated in section 1.1.A above. The PA shall consult as necessary with any of the following while drafting the
43 CB and shall confirm final direction with the CPM prior to issuing a CB:
44 1. City Project Manager (CPM) or City Construction Manager (CCM)
45 2. Owner
46 3. Members of the consulting staff
47 4. Members of city staff
48 5. The General Contractor
49 6. Sub-contractors
50 7. Commissioning Agent (CxA)
51 B. General Contractor: The GC shall be responsible for the following as needed:
52 1. Executing the directives of the CB when he/she believes that no changes in labor, materials, equipment,
53 or contract duration will be required for additions or deletions.
54 2. Submit a COR when he/she believes that a change in labor, materials, equipment or contract duration
55 will be required for additions or deletions.
56

1 **1.4. QUALITY ASSURANCE**

- 2 A. The PA shall be responsible for ensuring the final CB sufficiently provides direction, details, specifications and
3 other information as necessary for the GC to perform the intended Work.
4 B. The PA shall be responsible for ensuring the final CB is published as expeditiously as practical based on the
5 complexity of the CB being written. CBs that may affect the GC critical path shall be given priority.
6

7 **PART 2 – PRODUCTS – NOT USED**

8
9 **PART 3 - EXECUTION**

10
11 **3.1. WRITING THE CONSTRUCTION BULLETIN**

- 12 A. The CB form is located in the Construction Administration - Construction Bulletin Library on the Project
13 Management Web Site (SharePoint). The PA shall initiate the form as indicated in the execution section below.
14 B. The PA shall select the "Add Document" link in the CB Library
15 C. The PA shall draft a CB as needed using the Construction Bulletin form in SharePoint.
16 1. The PA and/or consulting staff as necessary shall provide specifications, model numbers and performance
17 data, details and other such information necessary to clearly state the intentions of the CB.
18 2. The consulting staff, CPM, Owner, CxA and other City Staff shall review the draft and recommend
19 changes as needed.
20 3. The PA shall amend the draft as necessary into a final CB for review
21 D. Once the final CB has been approved the CPM/CCM shall "Publish" the CB through the SharePoint to the GC.
22

23 **3.2. EXECUTING THE CONSTRUCTION BULLETIN**

- 24 A. The GC shall notify all Sub-contractors of the CB and publish the CB to all field sets of drawings and specifications
25 as appropriate.
26 B. The GC shall execute the directives of the CB or submit COR documentation as necessary during the execution
27 and implementation of the CB.
28 1. See Specification 01 26 57 Change Order Request (COR)
29
30
31

32 **END OF SECTION**
33

**SECTION 01 26 57
CHANGE ORDER REQUESTS (COR)**

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8 1.4. CONTRACT EXTENSION 3
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18

PART 1 – GENERAL

1.1. SUMMARY

- 19
20
21
22 A. Except in cases of emergency, no changes in the Work required by the Contract Documents may be made
23 by the General Contractor (GC) without having prior approval of the City Engineer or his representative.
24 1. For the purposes of this contract the only approved representatives of the City Engineer shall be the City
25 Project Manager (CPM) and the City Construction Manager (CCM) assigned to this project.
26 2. The GC shall verify with the CPM or CCM requests for changes in the Work from any other source before
27 proceeding with Change Order Requests and Change Orders.
28 B. The City may at any time, without invalidating the Contract and without Notice to Sureties, order changes in
29 the Work by written Change Order (CO). Such changes may include additions and/or deletions.
30 C. Where the City desires to make changes in the Work through use of written Change Order Request (COR), the
31 following procedures apply:
32 1. If requested by the City, the GC shall prepare and submit a detailed proposal, including all cost and time
33 adjustments to which the GC believes it will be entitled if the change proposed is incorporated into the
34 Contract. The City shall be under no legal obligation to issue a Change Order for such proposal.
35 2. The parties shall attempt in good faith to reach agreement on the adjustments needed to the Contract to
36 properly incorporate the proposed change(s) into the Work. In the event that the parties agree on such
37 adjustments, the City may issue a Change Order and incorporate such changes and agreed to
38 adjustments, if any.
39 3. In some instances, it may be necessary for the City to authorize Work or direct changes in Work for which
40 no final and binding agreement has been reached and for which unit prices are not applicable. In such
41 cases the following shall apply.
42 a. Upon written request by the City, the GC shall perform proposed Work
43 b. The cost of such change may be determined in accordance with this specification.
44 c. In the event agreement cannot be accomplished as contemplated herein, the City may authorize
45 the Work to be performed by City forces or to hire others to complete the Work. Such action on
46 the part of the City shall not be the basis of a claim by the GC for failure to allow it to perform the
47 changed Work.
48 D. Where changes in the Work are made by the City through use of a force account basis, the GC shall as soon as
49 practicable, and in no case later than ten (10) working days from the receipt of such order, unless another time
50 period has been agreed to by both parties, give the City written Notice, stating:
51 1. The date, circumstances and source of the extra work; and,
52 2. The cost of performing extra work described by such Order, if any; and,
53 3. Effect of the order on the required completion date of the Project, if any.
54 E. The giving of each Notice by the GC as prescribed by this specification, shall be a requirement to liability of the
55 City for payment of any additional costs incurred by the GC in implementing changes in the Work. Under this
56 specification, no order or statement of the City shall be treated as a Change Order, or shall entitle the GC to an
57 equitable adjustment of the terms of this Contract or damages for costs incurred by the GC on any activity for
58 which the Notice was not given.

- 1 F. In the event Work is required due to an emergency as described in this specification the GC must request an
- 2 equitable adjustment as soon as practicable, and in no case later than ten (10) working days of the
- 3 commencement of such emergency.
- 4 G. All GC requests for equitable adjustment shall be submitted to the CPM per the specifications below. Such
- 5 requests shall set forth with specificity the amount of and reason(s) for the proposed adjustment and shall be
- 6 accompanied by supporting information and documents.
- 7 H. No adjustment of any kind shall be made to this Contract, if asserted by the GC for the first time, after the date
- 8 of final payment.
- 9 I. This specification shall be used by the GC when preparing documentation for any COR to ensure each has been
- 10 properly and completely filled out as required by the City of Madison.
- 11 J. All COR documentation will be processed through the Construction Administration - Change Order Request
- 12 Library on the Project Management Web Site (SharePoint).

13
14 **1.2. RELATED SPECIFICATION SECTIONS**

- 15 A. Section 00 43 43 Wage Rates Form
- 16 B. Section 00 62 76.13 Sales Tax Form
- 17 C. Section 01 26 13 Request for Information (RFI)
- 18 D. Section 01 26 46 Construction Bulletins (CB)
- 19 E. Section 01 26 63 Change Order (CO)
- 20 F. Section 01 31 23 Project Management Web Site (SharePoint)
- 21 G. Section 01 91 00 Commissioning
- 22 H. Parts of this specification will reference articles within "The City of Madison Standard Specifications for Public
- 23 Works Construction".
 - 24 1. Use the following link to access the Standard Specifications web page:
 - 25 <http://www.cityofmadison.com/business/pw/specs.cfm>
 - 26 a. Click on the "Part" chapter identified in the specification text. For example, if the specification
 - 27 says "Refer to City of Madison Standard Specification 210.2" click the link for Part II, the Part II
 - 28 PDF will open.
 - 29 b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you
 - 30 to the referenced text.

31
32 **1.3. DEFINITIONS AND STANDARDS**

- 33 A. The City of Madison is a Tax Exempt Municipality. No contractor shall charge sales or other tax on any materials
- 34 purchased for this project. See specification 00 62 76.13 Sales Tax Form for more information.
- 35 B. LABOR: The amount of time and cost associated with the performance of human effort for a defined scope of
- 36 Work. Labor is further defined as follows:
 - 37 1. Labor rate is the total hourly rate which includes the basic rate of pay, fringe benefits plus each
 - 38 company's cost of required insurance, also referred to as a reimbursable labor rate.
 - 39 2. Unit labor is the labor hours anticipated to install the corresponding unit of material.
 - 40 3. Labor cost is the labor hours multiplied by the hourly labor rates.
- 41 C. MATERIAL: Actual material cost is the amount paid, or to be paid, by the GC for materials, supplies and
- 42 equipment entering permanently into the Work, including cost of transportation. The cost shall not exceed the
- 43 usual and customary cost for such items available in the geographical area of the project.
- 44 D. LARGE TOOLS AND MAJOR EQUIPMENT: Large tools and major equipment are those with an initial cost greater
- 45 than \$1,500, whether from the GC or other sources.
 - 46 1. Tool and equipment use and time allowed is only for extra work associated with change orders.
 - 47 a. Rental Rate is the machine cost associated with operating a piece of equipment for a defined
 - 48 length of time (hour, day, week, or month) and shall not exceed the usual and customary amount
 - 49 for such items available in the geographical area of the project.
 - 50 b. Rental cost is the rental rate multiplied by the anticipated duration the equipment shall be
 - 51 required.
 - 52 2. The GC shall provide a breakdown of all rental rates to indicate what items and costs are associated with
 - 53 the rate. Examples of items to include in the breakdown would be fuel consumption, lubrication,
 - 54 maintenance and other similar expenses but not including profit and overhead.
 - 55 3. When large tools and equipment needed for Change Order work are not already at the job site, the
 - 56 actual cost to get the item there is also reimbursable.
- 57 E. BOND COST: The cost shall be calculated at 1% of the total proposed change order.

- 1 F. SUB-CONTRACTOR COSTS: Sub-contractor costs are for those labor, material, and equipment costs required by
2 subcontracted specialties to complete the Change Order work including allowable markups as outlined within
3 this specification.
- 4 G. OVERHEAD AND PROFIT Markup: The allowable markup percentage to a COR by the GC and Sub-contractors for
5 overhead and profit. All of the following are expenses associated with overhead and profit and shall not be
6 reimbursable as individual items on any COR:
- 7 1. CHANGE ORDER PREPARATION: All costs associated with the preparing and processing of the change
8 order.
- 9 2. DESIGN, ESTIMATING, AND SUPERVISION: All such efforts, unless specifically requested by Owner as
10 additional Work to be documented as a COR or portion thereof.
- 11 3. INSTALLATION LAYOUT: The layout required for the installation of material and equipment, and the
12 installation design, is the responsibility of the GC.
- 13 4. SMALL TOOLS AND SUPPLIES: The cost of small hand tools with an initial cost of \$1,500 or less, along
14 with consumable supplies and expendable items such as drill bits, saw blades, gasoline, lubricating or
15 cutting oil, and similar items.
- 16 5. GENERAL EXPENSE: The general expense, which is those items that are a specific job cost not associated
17 with direct labor and material such as job trailers, foreman truck, and similar items.
- 18 6. RECORD DRAWINGS: The preparation of record or as-built drawings.
- 19 7. OTHER COSTS: Any miscellaneous cost not directly assessable to the execution of the Change Order
20 including but not limited to the following:
- 21 a. All association dues, assessments, and similar items.
- 22 b. All education, training, and similar items.
- 23 c. All drafting and/or engineering, unless specifically requested by Owner as additional Work to be
24 documented as a Change Order proposal or portion thereof.
- 25 d. All other items including but not limited to review, coordination, estimating and expediting, field
26 and office supervision, administrative work, etc.
- 27 H. Contract Extension: The necessary amount of time to be added to the contract deadlines for the completion of a
28 change order.

29
30 **1.4. CONTRACT EXTENSION**

- 31 A. The GC shall not assume that every COR will require a Contract Extension. If the GC feels a contract extension is
32 warranted, he/she shall provide sufficient scheduling information that shows how the COR being requested
33 impacts the critical path of the project.
- 34 B. The City of Madison strongly encourages the GC to explore alternative methods and practices prior to submitting
35 a COR with a request for contract extension.

36
37 **1.5. OVERHEAD AND PROFIT MARKUP**

- 38 A. Pursuant to the City of Madison Standard Specifications for Public Works Construction, Section 104.7, Extra
39 Work, the following maximum allowable markups shall be strictly enforced on all change orders associated with
40 the execution of this contract.
- 41 1. The total maximum overhead and profit shall not exceed fifteen percent (15%) of the total costs.
- 42 2. The total maximum overhead and profit shall be distributed as follows:
- 43 a. For work performed and materials provided solely by the General Contractor, fifteen percent
44 (15%) of the total costs.
- 45 b. For work performed and materials provided solely by Sub-contractors and supervised by the
46 General Contractor:
- 47 i. Supervision of the GC, five percent (5%) of the total Sub-contractor cost.
- 48 ii. Sub-contractors work and materials ten percent (10%) of the total Sub-contractor cost.

49
50 **1.6. PERFORMANCE REQUIREMENTS**

- 51 A. The GC shall become thoroughly familiar with this specification as it will identify procedures and expenses that
52 are or are not allowed under the Change Order and Change Order Request process.
- 53 B. The GC shall be responsible for all of the following:
- 54 1. Carefully reviewing the CB that is associated with the COR.
- 55 2. Collecting required supporting documentation from all contractors that quantify the need for a COR.
- 56 a. Labor hours
- 57 b. Labor rates

- 1 i. Labor rates as defined by Section 1.3(A)(1) above shall be submitted with supporting
2 documentation on the City's Reimbursable Labor Rate form prior to submitting any change
3 Order Requests.
4 c. Material costs
5 d. Equipment costs
6 C. The following shall apply to establishing prices for labor, materials, and equipment costs:
7 1. Where Work to be completed has previously been established by individual bid items in the contract bid
8 proposal the GC shall use the unit bid prices previously established.
9 2. Where Work to be completed was bid as a Lump Sum without individual bid items the GC shall provide a
10 breakdown of all labor, materials, equipment including unit rates and quantities required.
11 D. The completion date is determined by Owner. The schedule, however, is the responsibility of the GC. Time
12 extensions for extra Work will be considered when a schedule analysis of the critical path shows that the Change
13 Order Request places the Work beyond the completion date stated in the Contract.
14

15 **1.7. QUALITY ASSURANCE**

- 16 A. The GC shall be responsible for ensuring that all COR supporting documentation meets the following
17 requirements prior to completing the COR form on the Project Management Web Site (SharePoint):
18 1. Sufficiently indicates labor, material, and other expenses related to completing the intent of the CB.
19 2. No costs exceed the usual and customary amount for such items available in the geographical area of the
20 project, and no costs exceed those established under the contract.
21 B. The Project Architect (PA), Commissioning Agent (CxA), City Project Manager (CPM), other members of the
22 consulting staff, and city staff shall review all COR requests to ensure that the intent of the CB will be met under
23 the proposal of the COR or request additional information as necessary.
24

25 **PART 2 – PRODUCTS – NOT USED**

26
27 **PART 3 - EXECUTION**

28
29 **3.1. ESTABLISHING A CHANGE ORDER REQUEST**

- 30 A. Upon receipt of a Construction Bulletin (CB) where the GC believes a significant change in contract scope
31 warrants the submittal of a COR the GC shall do all of the following within ten (10) working days after receipt of
32 the CB:
33 1. Review the CB with all necessary trades and sub-contractors required by the change in scope.
34 a. Additions or deletions to the contract scope shall be as directed within the CB.
35 b. Additions or deletions of labor and materials shall be determined by the GC based on the
36 directives of the CB.
37 2. Assemble all required back-up documentation for additions and deletions of materials, labor and other
38 related contract costs as previously outlined in this specification.
39 3. Submit a COR request form on the Project Management Web Site (SharePoint).
40 B. Submitting a COR does not obligate the GC to complete the work associated with the COR nor does it obligate
41 the Owner to approve the COR as a change to the contract.
42

43 **3.2. SUBMIT A CHANGE ORDER REQUEST FORM**

- 44 A. Submit a COR only for Work related to a specific RFI or CB item. DO NOT combine multiple RFI or CB items into
45 the same COR.
46 1. Example; If a CB item is to move a wall and it affects plumbing, heating, electrical, and framing provide all
47 of the information necessary for this item but do not include information for a CB item that modifies the
48 parking lot.
49 B. The GC shall initiate a COR form in the Construction Administration – Change Order Request Library on the
50 Project Management Web Site (SharePoint) by clicking the "Add Document" link in the COR Library and
51 completely filling out the form as follows:
52 1. Provide only the following general information at the top of the form. All other information including
53 calculations is automatically populated.
54 a. Identify the document source this COR is related to.
55 b. Check if a Contract Extension is required.
56 c. Provide a brief description of this COR.
57 d. Add back up documentation as attachments as needed:
58 i. The City provided *COR Quote Worksheet* is required for each COR.

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**SECTION 01 26 63
CHANGE ORDER (CO)**

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6 1.2. RELATED SPECIFICATION SECTIONS 1
7 1.3. BOARD OF PUBLIC WORKS PROCEDURE 1
8 PART 2 – PRODUCTS – NOT USED 1
9 PART 3 - EXECUTION 2
10 3.1. PREPARATION OF THE CHANGE ORDER 2
11 3.2. ROUTING OF THE CHANGE ORDER 2
12 3.3. MONITORING THE CHANGE ORDER ROUTING 2
13

PART 1 – GENERAL

1.1. SUMMARY

- 17 A. Except in cases of emergency, no changes in the Work required by the Contract Documents may be made
18 by the General Contractor (GC) without having prior approval of the City Project Manager (CPM) or the City
19 Construction Manager (CCM).
20 B. The City may at any time, without invalidating the Contract and without Notice to Sureties, order changes in
21 the Work by written Change Order. Such changes may include additions and/or deletions.
22 C. The Change Order (CO) is a Board of Public Works (BPW) form that is reviewed and approved by a specific
23 process.
24 D. The CO form is typically made up of multiple Change Order Requests (CORs) and/or Bid Items as appropriate
25 depending on the type of project and how the contract was bid.
26 E. All CO documentation shall be processed through the Construction Administration-Change Order Library and
27 digital workflow on the Project Management Web Site (SharePoint).
28

1.2. RELATED SPECIFICATION SECTIONS

- 29
30 A. Section 01 26 13 Request for Information (RFI)
31 B. Section 01 26 46 Construction Bulletin (CB)
32 C. Section 01 26 63 Change Order Request (COR)
33 D. Section 01 31 23 Project Management Web Site (SharePoint)
34 E. Section 01 91 00 Commissioning
35

1.3. BOARD OF PUBLIC WORKS PROCEDURE

- 36
37 A. The Board of Public Works has a very explicit procedure for the review and approval of all change orders
38 associated with any Public Works Contract as follows:
39 1. The Supervisory Chain of the CPM/CCM shall review and approve any CO under \$20,000 provided it does
40 not include either of the following:
41 a. The CO does not request a time extension to the contract.
42 b. The CO does not cause the contract contingency sum to be exceeded.
43 2. The Board of Public Works shall review and approve any CO that requires any of the following:
44 a. Any CO over \$20,000.
45 b. Any CO requesting a time extension to the contract regardless of the monetary value of the CO.
46 c. Any CO that that causes the contract contingency sum to be exceeded.
47 B. The Board of Public Works generally meets every other week and only once in August and December. The GC is
48 cautioned that, under normal scheduling, a CO requiring a BPW review will take a minimum of two (2) weeks to
49 achieve final approval.
50 1. The City shall not be responsible for additional delays to the Work caused by the scheduling constraints
51 of the Board of Public Works.
52 C. ***SPECIAL NOTE:*** The GC is cautioned to never proceed unless told to do so by the CPM/CCM. Only in rare
53 instances may the CPM give a written notice to proceed on a COR without an approved CO. Proceeding without
54 the written notice of the CPM or an approved CO is at the GC's own risk.
55

PART 2 – PRODUCTS – NOT USED

1 **PART 3 - EXECUTION**

2
3 **3.1. PREPARATION OF THE CHANGE ORDER**

- 4 A. The CPM/CCM shall prepare the required CO forms in the Construction Administration-Change Order Library on
5 SharePoint as follows:
- 6 1. Provide information for all contract information.
 - 7 2. Provide a general description of the items described within the change order.
 - 8 3. Provide detailed information for each Item on the CO form. At the option of the CPM/CCM he/she may
9 include multiple Change Order Requests (COR) each as their own item.
 - 10 4. Provide required pricing and accounting information as needed for the item based on data provided by
11 the GC on an approved COR.
 - 12 5. Insert attachments of contractor/architect provided information that clarifies and quantifies the CO.
13 Attachments may include but not be limited to material lists, estimated labor, revised details or
14 specifications, and other documents that may be related to the requested change.
 - 15 6. Save the final version of the completed CO.

16
17 **3.2. ROUTING OF THE CHANGE ORDER**

- 18 A. Upon completing the CO form and Justification form the CPM/CCM shall save the form and click the Submit to
19 GC button. The SharePoint software will send email notification to the GC that a CO is available for his/her
20 review and signature.
- 21 B. Upon receiving the email notification the GC shall review the CO in SharePoint
- 22 1. The GC shall notify the CPM/CCM immediately of any errors or discrepancies on the form and shall not
23 sign or save it.
 - 24 a. The CPM/CCM shall make any corrections as needed, re-save the form, and notify the GC.
 - 25 2. If/when the GC concurs with the CO form as drafted the GC shall digitally sign and date the form and click
26 the Save Signature button. The SharePoint software will send email notification to the next routing
27 position for review and signature.
- 28 C. Each routing location shall review and digitally sign and date the form and SharePoint will continue to send
29 routing emails until all required signatures are completed.

30
31 **3.3. MONITORING THE CHANGE ORDER ROUTING**

- 32 A. The CPM/CCM shall monitor the routing process to ensure that:
- 33 1. The software is working properly at each review step.
 - 34 2. Ensure that proper BPW procedures are executed as needed by the CO approval process.
 - 35 a. Schedule the CO on the next available BPW agenda if required.
 - 36 i. Attend the BPW meeting to speak on the CO to board members and answer questions.
 - 37 ii. The GC and/or PA may be required to attend the BPW meeting to address specific
38 information as it relates to the Work and/or materials associated with the CO.
 - 39 3. Monitor final approval and distribution of the CO.
 - 40 4. Notify the GC that the CO has been completed.
 - 41 5. Ensure that the CO is posted to the next Public Works payment schedule.
 - 42 6. Verify that the GC's next Progress Payment-Schedule of Values show the CO as part of the contract sum.
- 43 B. Ensure that the Sharepoint software is indicating that the CO is complete in the SharePoint library.
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END OF SECTION

**SECTION 01 29 73
SCHEDULE OF VALUES**

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4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED SPECIFICATIONS 1
7 1.3. RELATED DOCUMENTS 1
8 1.4. BASIS OF VALUES 2
9 PART 2 – PRODUCTS – THIS SECTION NOT USED 2
10 PART 3 - EXECUTION 2
11 3.1. AIA DOCUMENT G702 – APPLICATION AND CERTIFICATE FOR PAYMENT 2
12 3.2. AIA DOCUMENT G703 – CONTINUATION SHEET 2
13 3.3. INITIAL SCHEDULE OF VALUES SUBMITTAL 3
14 3.4. SOV FOR PROGRESS PAYMENT REQUESTS 3
15

PART 1 – GENERAL

1.1. SUMMARY

- 19 A. The Schedule of Values (SOV) is a Contractor provided statement that allocates portions of the total contract
20 sum to various portions of the contracted work and shall be the basis for reviewing the Contractors Progress
21 Payment Requests.
22 B. AIA Document G702 – Application and Certificate for Payment and AIA Document G703 Continuation Sheet shall
23 be filled out in sufficient detail to be used as a guideline in determining work completed and materials stored on
24 site when verifying Progress Payment Requests.
25 C. The General Contractor shall be responsible for filling out, updating, and providing these work sheets with each
26 Progress Payment Request.
27

1.2. RELATED SPECIFICATIONS

- 29 A. Section 01 26 63 Change Order (CO)
30 B. Section 01 29 76 Progress Payment Procedures
31 C. Section 01 31 23 Project Management Web Site (SharePoint)
32 D. Section 01 32 26 Construction Progress Reporting
33 E. Section 01 33 23 Submittals
34 F. Parts of this specification will reference articles within “The City of Madison Standard Specifications for Public
35 Works Construction”.
36 1. Use the following link to access the Standard Specifications web page:
37 <http://www.cityofmadison.com/business/pw/specs.cfm>
38 a. Click on the “Part” chapter identified in the specification text. For example if the specification
39 says “Refer to City of Madison Standard Specification 210.2” click the link for Part II, the Part II
40 PDF will open.
41 b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you
42 to the referenced text.
43

1.3. RELATED DOCUMENTS

- 45 A. The following documents shall be used as the basis for initiating and maintaining the SOV worksheets throughout
46 the execution of this contract.
47 1. Drawing documents and specifications (including general provisions) as provided with the bid set
48 documents and any published addendums.
49 2. Documents associated with revisions or clarifications to number 1 above after awarding of the contract,
50 including but not limited to:
51 a. Construction Bulletins
52 b. Request for Information
53 c. Approved Change Orders
54 3. The latest daily/weekly Construction Progress Report
55 4. Other specifications as identified in Section 1.2 above

1
2 **1.4. BASIS OF VALUES**

- 3 A. The Contractor shall provide a breakdown of the Contract Sum in sufficient detail to assist the Project Architect
4 (PA), City Project Manager (CPM), and City Construction Manager (CCM) in evaluating Progress Payment
5 Requests. The breakdown detail may require a labor and material breakdown for each division of work or trade
6 or as directed by the CPM.
7 B. The total sum of all items shall equal the Contract Sum.
8

9 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

10
11 **PART 3 - EXECUTION**

12
13 **3.1. AIA DOCUMENT G702 – APPLICATION AND CERTIFICATE FOR PAYMENT**

- 14 A. The Contractor shall use AIA Document G-702 Application and Certificate for Payment with each Progress
15 Payment Request.
16 B. Completely fill out the Project Information section as follows:
17 1. TO OWNER; provide all owner related information as provided in the contract documents.
18 2. PROJECT; provide all contract information including the contract number, title and address.
19 3. FROM CONTRACTOR; provide all contractor related information.
20 4. VIA ARCHITECT; provide all the architect's related information including the architect's project reference
21 number if different from the owners.
22 5. Indicate the current APPLICATION NO., PERIOD TO date, and CONTRACT DATE.
23 C. Completely fill out the Contractors Application for Payment section.
24 1. Fill out lines 1 through 9 to reflect the current status of the contract through the payment date being
25 requested.
26 2. The City of Madison calculates retainage on Public Works Contracts as follows:
27 a. In general, across the duration of the contract, 2.5% of the total contract sum, including change
28 orders, is withheld for retainage as referenced from the City of Madison Standard Specification
29 110.2:
30 i. Beginning with Progress Payment 1, 5% retainage will be withheld until such time that 50%
31 of the total contract sum has been paid out.
32 ii. No additional retainage will be withheld after 50% of the total contract sum has been paid,
33 unless additional change orders have been approved after the 50% milestone has been
34 reached. Per City of Madison Standard Specification 110.2, additional retainage up to 10%,
35 may be held in the event there are holds placed by Affirmative Action or liquidated
36 damages by BPW.
37 iii. Retainage for additional change orders after the 50% milestone will be withheld at the rate
38 of 2.5% of the total cost of the change order.
39 iv. Retainage is based on the change orders posted to the City's contract worksheet at the
40 time the progress payment is processed.
41 D. Completely fill out the Change Order Summary section. Only change orders that have been finalized and posted
42 to the City of Madison's Application for Partial Payment worksheet may be itemized into the SOV documents.
43 E. The Contractor shall sign and date the application and it shall be properly notarized.
44 F. The Contractor shall not fill in any information in the Architects Certificate for Payment section.
45

46 **3.2. AIA DOCUMENT G703 – CONTINUATION SHEET**

- 47 A. The Contractor shall use AIA Document G-703 Continuation Sheet to itemize his/her SOV for this contract.
48 Provide additional sheets as necessary.
49 B. Provide information in Column A (Item No.), Column B (Description of Work), and Column C (Scheduled Value) by
50 any method that allocates portions of the total contract sum to various portions of the contracted work.
51 Possible methods include combinations of the following:
52 1. By division of work
53 2. By contractor, sub-contractor, sub sub-contractor
54 3. By specialty item or group
55 4. Other methods of breakdown as may be requested by the CPM or CCM at the pre-construction meeting.
56 C. Provide total cost of the item/description of work including proportionate shares of profit and overhead related
57 to the item.
58

1 **3.3. INITIAL SCHEDULE OF VALUES SUBMITTAL**

- 2 A. The Contractor shall upload his/her INITIAL SOV to the Construction Administration - Submittals Library on the
3 Project Management Web Site (Sharepoint), no later than five (5) working days after the Pre-construction
4 Meeting.
5 1. The initial SOV shall provide information in Column A (Item No.), Column B (Description of Work), and
6 Column C (Scheduled Value) only.
7 2. The level of detail shall be as described in section 3.2 above.
8 B. The PA, CPM, and CCM shall review the SOV as any other submittal and may require modifications to reflect
9 additional detail as necessary.
10 C. The Contractor shall resubmit the SOV as necessary until such time as the PA, CPM, and CCM have sufficient
11 detail for assessing and approving future Progress Payment Applications.
12 D. Progress Payment Application 1 will not be processed until such time as the Contractor has met this requirement
13 regardless of the amount of work completed per the application.
14

15 **3.4. SOV FOR PROGRESS PAYMENT REQUESTS**

- 16 A. The Contractor shall update the SOVs with each Progress Payment Application as follows:
17 1. Initial items and values as part of Section 3.3 above will not be adjusted once the original Schedule of
18 Values submittal has been approved.
19 2. Change orders shall be added as additional items and values at the bottom of the SOV as they become
20 approved and posted to the City's contract worksheet. The value for each change order shall be the
21 value indicated on the SOV and shall stand alone. Values shall not be split out or combined with other
22 existing items with similar work descriptions on the original SOV.
23 a. I.E. DO NOT split out costs for plumbing, heating, etc. and put them into separate categories or
24 combine them into the original SOV totals
25 3. Fill out Columns D, E, F and G to properly reflect the work completed and materials received since the last
26 Progress Payment Application.
27 4. Only materials delivered and stored on the project site may be reflected on SOV progress updates.
28 B. Provide updated G702 and G703 sheets with each Progress Payment application.
29 C. See Specification 01 29 76 Progress Payment Procedures for additional information on submitting Progress
30 Payment Applications.
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34 **END OF SECTION**
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SECTION 01 29 76
PROGRESS PAYMENT PROCEDURES

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15

PART 1 – GENERAL

1.1. SUMMARY

- 19 A. The General Contractor (GC) shall review this and all related specifications prior to submitting progress payment
20 requests.
21 B. Progress payment requests (Partial Payment-PP) for this contract shall be uploaded digitally by the GC to the
22 Project Management Web Site SharePoint).
23 C. The Project Architect (PA) and the City Project Manager (CPM) or the City Construction Manager (CCM) shall
24 review and amend or approve the PP on the SharePoint.
25 D. After approval of the PP by the CPM, he/she shall forward the PP to the appropriate agencies for BPW
26 contractual review and payment processing.
27

1.2. RELATED SPECIFICATIONS

- 29 A. Section 01 26 63 Change Order (CO)
30 B. Section 01 29 73 Schedule of Values
31 C. Section 01 31 19 Progress Meetings
32 D. Section 01 31 23 Project Management Web Site (SharePoint)
33 E. Section 01 32 16 Construction Progress Schedules
34 F. Section 01 32 19 Submittals Schedule
35 G. Section 01 32 26 Construction Progress Reporting
36 H. Section 01 32 33 Photographic Documentation
37 I. Section 01 33 23 Submittals
38 J. Section 01 45 16 Field Quality Control Procedures
39 K. Section 01 77 00 Closeout Procedures
40 L. Section 01 78 13 Completion and Correction List
41 M. Section 01 78 23 Operation and Maintenance Data
42 N. Section 01 78 36 Warranties
43 O. Section 01 78 39 As-Built Drawings
44 P. Section 01 78 43 Spare Parts and Extra Materials
45 Q. Section 01 79 00 Demonstration and Training
46

1.3. RELATED DOCUMENTS

- 48 A. The following documents shall be used when evaluating PP requests.
49 1. Daily and weekly construction progress reports filed since the last payment request.
50 2. Contractors Schedule of Values as updated from the last payment request. See Specification 01 29 73.
51 3. Any document that may be required to be submitted for review and approval, as noted by the
52 specifications listed in Section 1.2 above, or the Progress Payment Milestone Schedule in Section 1.4
53 below, to achieve a required bench mark of contract progression or contract requirement.
54

1.4. PROGRESS PAYMENT MILESTONES

- 56 A. City Engineering-Facility Management has developed the Project Payment Milestone Schedule (Section 1.4
57 below) to assist the GC in providing required construction specific documentation and general contractual
58 documentation in a timely manner.

- 1 B. The Progress Payment Milestone Schedule is not an all inclusive list. Multiple agencies review progress payment
2 requests and contract closeout requests. Missing, incomplete, or incorrect documentation for any agency may
3 be a cause for not processing progress payments. It shall be the sole responsibility of the Contractor for
4 providing documentation as required or requested to the appropriate agencies.
5 C. The milestone schedule is based on the contract total sum and shall be valid for most contracts. Milestone
6 submittals will be required with whatever progress payment hits the percentage of contract total indicated in
7 the schedule.
8 D. The CPM/ccm shall review the milestone schedule with each progress payment request and at his/her option
9 may elect to hold processing the progress payment until such time as the contractor has met the requirements
10 for providing construction specific documentation.
11 E. It shall be the General Contractors responsibility to comply with all BPW Contract Administration requirements
12 and related deadlines as outlined in the Award Letter, Award Checklist, and Start Work Letter.
13

Progress Payment (PP) Milestone Schedule		
Milestone Description	Due Before	Remarks
BPW Contract Administration Documentation <ul style="list-style-type: none"> • Workforce profiles • Best Value Contracting Documentation • Sub-contractors prequalification approval & Affirmative Action plans • Other as may be required 	PP-1, or start work as applicable	<ul style="list-style-type: none"> • For GC and Sub-contractors before PP-1 regardless of scheduling • Sub-contractors (if applicable), due 10 days before they may start work • Sub-contractors (if applicable), due 10 days before they may start work
Required Administrative Submittals <ul style="list-style-type: none"> • Wage Rates Form • Contractors Project Directory • Schedule of Values • Submittals Schedule • Photographic Documentation • Mockups • Testing Laboratory Services • Waste Management Plan • Closeout Requirement Checklist • Operation and Maintenance Data • Warranty Checklist • Spare Parts and Extra Materials • Demonstration and Training 	PP-1	References <ul style="list-style-type: none"> • Specification 00 43 43 • Specification 01 31 23 • Specification 01 29 73 • Specification 01 32 19 • Specificaiton 01 32 33 • Specification 01 43 39 • Specification 01 45 29 • Specification 01 74 19 • Specification 01 77 00 • Specification 01 78 23 • Specification 01 78 36 • Specification 01 78 43 • Specification 01 79 00
Construction Progress Milestones <ul style="list-style-type: none"> • Early submittals, per submittal schedule • Detailed Contract Schedules 	PP-1	See specifications for specific requirements <ul style="list-style-type: none"> • Specification 01 32 19, Examples: concrete mix, structural steel, products with long lead times • Specification 01 32 16
General Construction Progress Requirements are all up to date <ul style="list-style-type: none"> • Progress Schedules • Submittals/Re-submittals (ongoing) • Schedule of Values • Progress Reporting • LEED Documentation • Waste Management documentation • QMOs are being addressed and closed 	Each future PP	Verified with each Progress Payment Request <ul style="list-style-type: none"> • Specification 01 32 16 • Specification 01 33 23 • Specification 01 29 73 • Specifications 01 32 26, 01 32 33 • All specifications with LEED documentation requirements • Specification 01 74 19 • Specification 01 45 16

Progress Payment (PP) Milestone Schedule		
Milestone Description	Due Before	Remarks
<ul style="list-style-type: none"> Progress Cleaning As-Built Drawings 		<ul style="list-style-type: none"> Specification 01 74 13 Specification 01 78 39
* All of the above are being updated on the Project Management Web Site as required		
BPW Contract Administration Documentation <ul style="list-style-type: none"> Weekly payroll reports Best Value Contracting Reports SBE Reports 	25% CT or PP 2	See 1.4.E above. <i>This progress payment will be withheld by BPW for any missing contractual documentation.</i>
Construction Progress Milestones <ul style="list-style-type: none"> Construction/Contract Closeout Meeting #1 Submittals/Re-submittals complete 	50% CT	<ul style="list-style-type: none"> Specification 01 31 19 Specification 01 33 23
Operation and Maintenance (O & M) drafts	60% CT	<ul style="list-style-type: none"> Specification 01 78 23
Construction/Contract Closeout Meeting #2 <ul style="list-style-type: none"> Construction Closeout Checklist Schedule Punch List Review Meeting 	70% CT	<ul style="list-style-type: none"> Specification 01 31 19 Specification 01 77 00 Specification 01 78 13
BPW Contract Administration Documentation <ul style="list-style-type: none"> Request Finalization Review from BPW 	80% CT	This is a recommendation to the GC and is not a requirement of this PP. <ul style="list-style-type: none"> Specification 01 77 00
Construction Progress Milestones <ul style="list-style-type: none"> Operation and Maintenance (O & M) finals, accepted All major QMO issues resolved As-Built Drawings, Division Trades ready for GC review 	80% CT	<ul style="list-style-type: none"> Specification 01 78 23 Specification 01 45 16; Items that could prevent occupancy Specification 01 78 39
Progress payment milestones <ul style="list-style-type: none"> Conduct Punch List Review Punch List Corrections completed Regulatory Inspections completed Photographic Documentation completed All QMO reports closed Demonstration and Training completed Attic Stock completed Final Cleaning 	90% CT	Contractor to determine the proper order of completion: <ul style="list-style-type: none"> Specification 01 78 13 Governing ordinances and statutes Specification 01 32 33 Specification 01 45 16 Specification 01 79 00 Specification 01 78 43 Specification 01 74 13
Construction Closeout Procedures: <ul style="list-style-type: none"> Letter of Substantial Compliance sent to BI and DHS as needed Certificate of Occupancy issued As-Built Drawings, finals, accepted City Letter of Substantial Completion Warranty letters dated and issued 	100% CT	<ul style="list-style-type: none"> Specification 01 77 00 Generated/Signed by the Architect Building Inspection Specification 01 78 39 Signed by the City Engineer Specification 01 78 36
* Completion of this begins the one year warranty.		
BPW Contract Administration Documentation Contract	Final	<ul style="list-style-type: none"> Specification 01 77 00

Progress Payment (PP) Milestone Schedule		
Milestone Description	Due Before	Remarks
Closeout Procedures <ul style="list-style-type: none"> • Construction Closeout has been completed • Contractor requests final payment of retainage upon receiving City Letter of Substantial Completion • All BPW contractual requirements are verified 		<ul style="list-style-type: none"> • Contractor must provide any missing BPW Contractual Documentation
* Completion of this closes the contract but not the warranty period/bond.		
NOTE: CT = Contract Total less held retainage		

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1.5. PROGRESS PAYMENT SUBMITTAL

- A. Each progress payment submittal shall be:
 - 1. Digital in PDF format
 - 2. PDF shall be in color
 - 3. Uploaded to the appropriate Project Management library and properly named per the tutorial instructions provided to the awarded contractor.
- B. Submit all required construction progress documentation to the appropriate SharePoint library.
- C. In general the following shall apply to all PP requests:
 - 1. Materials or products:
 - a. On order, being shipped, etc. may not be invoiced.
 - b. Received and stored on the project site may be invoiced.
 - c. Being manufactured off site at any location may not be invoiced (example: cabinetry, ductwork, etc.)
 - d. Completed products stored off site locally waiting for delivery to the project site may be invoiced with prior approval by the CPM/CCM. All of the following conditions must be met to be allowed:
 - i. Items must be visually inspected by CPM/CCM to verify product is complete.
 - ii. Item must be stored inside a compatible structure and the structure and contents must be insured.
 - iii. Contractor is responsible for condition until installation is completed and accepted.
 - 2. All labor and equipment, including rental time for the current progress period may be invoiced.
 - 3. Only completed installations may be invoiced to 100% based on the Schedule of Values.
- D. **DO NOT** submit BPW Contract Administration Documentation for review with Progress Payment Requests, submit them directly to the correct agency and in the correct format as instructed from information in your BPW Contract Award Packet instructions.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1. GENERAL CONTRACTOR PROCEDURE

- A. The GC shall provide an updated version of his/her schedule of values (AIA documents G702 & G 703) with each PP request.
 - 1. The AIA - Application and Certificate for Payment (G702) shall be properly filled out and prepared for the Architects review. See specification 01 29 73, Schedule of Values for more information.
 - 2. The AIA - Continuation sheets (G703) shall be properly filled out and indicate the dollar value of the completed work to date for each item on the form. See specification 01 29 73, Schedule of Values for more information.
 - a. The GC shall subtotal the work completed to date for all of the original Schedule of Value items.
 - b. Divide the sub total of work completed by the Original Contract Total to obtain a percentage complete of the original Lump Sum Bid. This percentage may be taken out to five (5) decimal places (round fifth place up or down as needed).
 - i. Example: \$5,192.55 of completed work divided by \$10,000 original Contract Total = 0.519255, round this to 0.51926

- 1 c. Write the percentage in Column 10 on the City Tabular Sheet for the original lump sum bid item in
2 RED ink.
- 3 3. Ensure that any newly posted change orders from the City of Madison provided tabulation sheet have
4 been entered on the G703 continuation sheets. Repeat steps a thru c above for each change order on
5 the schedule of values and the City Tabular Sheet.
- 6 B. The GC shall fill out the City of Madison Application and Certificate of Payment cover sheet as follows:
- 7 1. The GC shall not change any pre-printed information and shall not write in the box that indicates previous
8 progress payments.
- 9 2. The GC shall sign and date the form where indicated.
- 10 3. The GC shall provide the dates from and to for the PP being requested.
- 11 4. The GC shall provide the list of all contractors/sub-contractors that were actively working during the
12 dates indicated above.
- 13 a. All contractors/sub-contractors named must be in compliance with all City requirements (Pre-
14 qualified, Affirmative Action Plan on file, etc). The PP will be held and not processed by the City of
15 Madison until all contractors/sub-contractors are in compliance.
- 16 b. Do not list the names of suppliers or manufacturers, doing so will slow down processing and
17 require a re-submittal of the paperwork.
- 18 C. The General Contractor (GC) shall scan all of the documents listed below in the order shown, save the scan as a
19 single PDF file for each PP request.
- 20 1. City cover sheet – Application and Certificate for Payment
- 21 2. City tabulation sheet(s)
- 22 3. AIA G702 - Application and Certificate for Payment
- 23 4. AIA G703 - Continuation Sheet(s)
- 24 5. Any miscellaneous documents that may be requested as backup documentation for the pay request.
- 25 a. Lien waivers are not required and shall not be submitted.
- 26 b. Do not provide contractual administrative documents such as pay reports with pay requests.
- 27 c. Do not supply progress deliverables with pay requests.
- 28 F. Upload the pay request PDF to the Contract Documents-GC Partial Pay Apps library on the Project Management
29 Web Site.

30
31 **3.2. PROJECT ARCHITECT PROCEDURE**

- 32 A. The PA shall review the AIA-continuation sheets provided by the GC to determine if the Schedule of Values
33 accurately reflects the work completed for the inclusive dates indicated.
- 34 B. The PA shall advise the CPM of any discrepancies in the schedule of values.
- 35 C. The PA shall work with the GC and the CPM to resolve any issues prior to signing the AIA - Application and
36 Certificate for Payment.
- 37 D. When verified, the PA shall digitally sign the original PDF version of the AIA - Application and Certificate for
38 Payment on SharePoint.

39
40 **3.3. CITY PROJECT MANAGER PROCEDURE**

- 41 A. The CPM/CCM shall review all documents submitted by the GC and work with the PA to ensure the schedule of
42 values accurately reflects the work completed to date.
- 43 B. The CPM/CCM may elect to hold processing of any progress payment pending submittal of required progress
44 payment milestones.
- 45 C. When verified, the CPM/CCM shall digitally sign the City Cover Sheet and forward the required documentation to
46 the appropriate City agencies for further processing of the payment request.
- 47 D. The CPM/CCM shall add a scanned copy of any documents indicating the PP request processing was completed
48 to SharePoint.

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53 **END OF SECTION**
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**SECTION 01 31 13
PROJECT COORDINATION**

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7 1.3. GENERAL REQUIREMENTS 1
8 1.4. GENERAL CONTRACTOR PERFORMANCE REQUIREMENTS 2
9 1.5. SUB-CONTRACTOR PERFORMANCE REQUIREMENTS 2
10 PART 2 – PRODUCTS – THIS SECTION NOT USED 3
11 PART 3 – EXECUTION – THIS SECTION NOT USED 3
12

PART 1 – GENERAL

1.1. SUMMARY

- 16 A. Project Coordination covers many areas within the execution of the Contract Documents and the requirements
17 of proper coordination are the applicable to all contractors executing the Work of this contract.
18 B. This specification provides general information regarding project coordination for the General Contractor and all
19 Sub-contractors. All contractors shall be familiar with project coordination requirements and responsibilities
20 that may be defined in other specification within these Contract Documents.
21 C. The General Contractor shall at all times be responsible for the project, project site, and execution of the
22 Contract Documents.
23

1.2. RELATED SPECIFICATIONS

- 24 A. Section 01 29 76 Progress Payment Procedures
25 B. Section 01 31 19 Progress Meetings
26 C. Section 01 31 23 Project Management Web Site (SharePoint)
27 D. Section 01 32 16 Construction Progress Schedules
28 E. Section 01 32 19 Submittals Schedule
29 F. Section 01 33 23 Submittals
30 G. Section 01 43 39 Mockups
31 H. Section 01 45 16 Field Quality Control Procedures
32 I. Section 01 60 00 Product Requirements
33 J. Section 01 77 00 Closeout Procedures, including all specifications referenced therein
34 K. Section 01 91 00 Commissioning
35
36

1.3. GENERAL REQUIREMENTS

- 38 A. The following general requirements shall be applicable to all contractors:
39 1. Cooperate with the Owner, all authorized Owner Representatives, Project Architect and all consultants of
40 the Owner.
41 2. Materials, products, and equipment shall be new, as specified and to industry standards except where
42 otherwise noted.
43 3. Labor and workmanship shall be of a high quality and to industry standards.
44 B. Existing conditions:
45 1. Verify all existing conditions noted in the contract documents with actual filed locations. Verify
46 dimensions, sizes and locations, of structural, equipment, mechanical and utility components.
47 2. Report any inconsistencies, errors, omissions, or code violations in writing to the General Contractor (GC)
48 immediately.
49 3. Annotate any inconsistencies, errors, omissions on the GC As-Built record drawings immediately for
50 future reference.
51 C. Contract Documents:
52 1. The Contract Documents are intended to include everything necessary to perform the work. Every item
53 required may not be specifically mentioned, shown, or detailed.
54 a. Except where specifically stated all systems and equipment shall be complete, installed, and fully
55 operable.
56 b. If a conflict exists within the contract documents the contractor shall furnish the item, system, or
57 workmanship of the highest quality, largest, largest quantity, or most closely fits the intent of the
58 contract documents.

- 1 c. Manufacturers recommended installation details shall be verified and used prior to installation of
- 2 products and equipment so as to not void warranties.
- 3 D. Errors and Omissions
- 4 1. No Contractor shall take any advantage of any apparent error or omission in the construction documents.
- 5 2. The City of Madison shall be permitted to make such corrections and interpretations as may be deemed
- 6 necessary for the fulfillment of the intent of the construction documents.
- 7 E. Owners Representatives
- 8 1. All contractors shall be familiar with various Owner Representatives having Quality Management
- 9 responsibilities for the duration of this project including but not limited to the following:
- 10 a. Project Architect, responsible for all decisions affecting the code compliance and design intent of
- 11 the construction documents.
- 12 b. Consulting Architects and Engineers, responsible for providing consulting services to the Project
- 13 Architect, Owner, and City Project Manager, also responsible for Quality Management of the
- 14 construction documents.
- 15 c. Owner, the designated representative of the City Agency that will occupy the project upon
- 16 completion.
- 17 d. City Project Manager (CPM or City Construction Manager (CCM), responsible for all day to day
- 18 decisions regarding the execution and performance of this Public Works Contract.
- 19 e. Consulting City Staff, responsible for providing consulting services to the Project Architect, Owner,
- 20 and City Project Manager, also responsible for Quality Management of the construction
- 21 documents.
- 22 f. Commissioning Agent (CxA), responsible for ensuring that the project is meeting the Owner's
- 23 Project Requirements and related quality assurance procedures.
- 24 2. Owner Representatives shall be attending progress meetings, pre-installation meetings, performing or
- 25 being present for final testing and acceptance and quality management reporting during the execution of
- 26 the contract documents as outlined in other specifications.
- 27

28 **1.4. GENERAL CONTRACTOR PERFORMANCE REQUIREMENTS**

- 29 A. Assume the responsibility for all Work specified in the Contract Documents except where specifically identified
- 30 to be performed by the Owner or other contractor separately hired by the Owner.
- 31 1. Coordinate all work by Owner, equipment provided Owner, or contractor hired by the Owner into the
- 32 project schedule.
- 33 B. Provide all construction management responsibilities as specified in other Division 1 specifications including but
- 34 not limited to:
- 35 1. Scheduling of work
- 36 2. Coordination of work between other Trades and Sub-contractors
- 37 3. Construction administration and management
- 38 4. Site layout, cleanliness, and protection of completed work/stored materials
- 39 5. Waste Management
- 40 6. Quality Assurance and Quality Control
- 41 C. Use Diggers Hotline and private utility locating companies to accurately locate all public and private utilities on
- 42 the property as needed. The GC is responsible for any repair or replacement to any public or private utility
- 43 damaged during the execution of the Work
- 44 D. Report any inconsistencies, errors, omissions, or code violations in writing to the Project Architect immediately.
- 45 Failure to report inconsistencies prior to beginning work shall indicate that the GC accepted all existing
- 46 conditions.
- 47 E. The GC shall be responsible for assigning work and related responsibilities where the Contract Documents may
- 48 not clearly state who is responsible for providing the work, material, or product.
- 49 F. Provide construction management oversight of all items described in Section 1.5 below.
- 50 G. Coordinate and assist CxA as outlined within 01 91 00 and as directed by Owner.
- 51

52 **1.5. SUB-CONTRACTOR PERFORMANCE REQUIREMENTS**

- 53 A. Be familiar with all of the contract documents as they pertain to your Work, adjacent work and the overall
- 54 progress of the project.
- 55 1. All Sub-contractors shall be familiar with all Division 1 specifications as they may apply to progress,
- 56 progress payments, quality control construction management, and closeout of the contract.
- 57 B. Coordinate your Work with all adjacent work and existing conditions.

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1. Perform your work in proper sequence according to the GC's project schedule and in relation to the work of other trades.
 2. Notify other sub-contractors and trades whose work may be connected to, combined with, or influenced by your work and allow them reasonable time and access to complete their work.
 3. Join your work to the work of others in accordance with the intent of the Contract Documents.
 4. Order materials and schedule deliveries to facilitate the general progress of the Work.
- C. Cooperate with all other trades to facilitate the general progress of the work. This shall include providing every reasonable opportunity for the installation of work by others and the storage of their materials and equipment.
1. In no case shall any contractor exclude from the premises or work any Sub-contractor or their employees.
 2. In no case shall any contractor interfere with the execution or installation of Work by any other Sub-contractor or their employees.
- D. Arrange your work, equipment, and materials and dispose of your construction waste so as to not interfere with the work or storage of materials of others.
- E. Coordinate all work as indicated during pre-installation meetings with Owner Representatives, the GC and other trades. Any work improperly coordinated shall be relocated as designated by the Owner Representative at no additional cost to the City.
- F. Coordinate and assist CxA as outlined within 01 91 00 and as directed by Owner.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

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**SECTION 01 31 19
PROJECT MEETINGS**

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PART 1 – GENERAL

1.1. SUMMARY

- 21 A. The purpose of this specification is to identify various project related meetings and the responsible parties for
22 scheduling, agendas, minutes, and required attendance.
23 B. This specification is not intended to be inclusive of all meeting types or a complete list of required meetings.
24 C. This specification is not intended to cover planning and execution meetings between the General Contractor
25 (GC) and his/her sub-contractors.

1.2. RELATED SPECIFICATIONS

- 28 A. 01 31 23 Project Management Web Site (SharePoint)
29 B. 01 32 16 Construction Progress Schedules
30 C. 01 43 39 Mockups
31 D. 01 50 00 Temporary Facilities and controls
32 E. 01 91 00 Commissioning
33

1.3. PROJECT MEETING TYPES

- 35 A. The following project meeting types may be used but not limited to the following
36 1. Preconstruction Meeting
37 2. Project Management Web Site (SharePoint) – Tutorial Meeting
38 3. Construction Progress Meetings
39 4. Pre-installation Meetings (including mock-up review meetings)
40 5. Weekly Trade Meetings
41 6. Special Meetings
42 7. Commissioning Meetings
43

1.4. GENERAL REQUIREMENTS

- 45 A. Representatives of Contractors, Subcontractors, and suppliers attending meetings shall be qualified and
46 authorized to act on behalf of the entity each represents.
47

PART 2 – PRODUCTS – NOT USED IN THIS SECTION

PART 3 - EXECUTION

3.1. PRECONSTRUCTION MEETING

- 53 A. After execution of the Contract the City Project Manager (CPM) shall schedule and conduct the Preconstruction
54 Meeting at the Owner’s facilities. The CPM shall coordinate the meeting agenda with the Project Architect and
55 the GC Project Manager.
56 B. The CPM shall be responsible for the final agenda.
57 C. The CPM and Project Architect shall take notes on the meeting and post completed meeting minutes.
58 D. Attendance shall be required by all of the following:

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1. Owner Representative(s)
 2. Architect and applicable sub consultant(s)
 3. General Contractor and applicable subcontractors and suppliers
 4. City Quality Management Staff
 5. Commissioning Agent
 6. Others, as may be invited for particular agenda items.
- E. Topics of the Preconstruction Meeting shall include but not be limited to the following:
1. Staff and contractor introductions
 2. Completion Date
 3. BPW Administrative requirements and due outs
 - a. Small Business Enterprise (SBE) (if applicable)
 - b. Certified payroll forms
 - c. Workforce profiles
 - d. Best Value Contracting (BVC)
 4. General Facility Management Division 1 Specifications, including:
 - a. Section 01 26 13 Request for Information
 - i. Clarification by phone or email before starting an RFI
 - ii. RFI review turnaround time
 - b. Section 01 29 76 Progress Payment Procedures
 - c. Section 01 31 23 Project Management Web Site (SharePoint) (overview)
 - d. Section 01 33 23 Submittals
 - i. Do's and Don'ts of a good submittal
 - ii. Submittal review turnaround time
 - e. Section 01 45 16 Field Quality Control Procedures
 - f. Section 01 77 00 Closeout Procedures
 - g. Section 01 91 00 Commissioning
 5. Project Meeting scheduling
 - a. Section 01 31 19 Project Meetings
 6. Construction Schedule
 7. Commissioning Process

3.2. PROJECT MANAGEMENT WEB SITE (SHAREPOINT) – TUTORIAL MEETING

- A. The CPM shall schedule and conduct a tutorial presentation of SharePoint prior to the beginning of construction.
- B. The CPM shall be responsible for the final agenda, there will be no minutes.
- C. The required attendance list in 3.1.D. above shall apply except for City Staff in items 1 and 4 who are already familiar with the SharePoint system.
- D. It is recommended that all contractors bring their lap top, tablet or other internet capable device with them including a fully charged battery and internet connection devices as necessary.

3.3. CONSTRUCTION PROGRESS MEETINGS

- A. In general all of the following shall apply:
 1. Representatives of Contractors, Subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
 2. The attendance shall be from the required attendance list in 3.1.D. above.
- B. The General Contractor Project Manager (GCPM) shall:
 1. Schedule and conduct all construction progress meetings biweekly or more frequently as required.
 - a. For the purposes of this contract the Owner will be providing the meeting spaces as noted in this section.
 - i. Meeting space to be the Upstairs Meeting Room in the Original Visitor Center. See sheet G001 for location. This location is rental space, scheduled meeting must end promptly as the space may be rented following the progress meeting.
 - ii. Meetings to be every other Wednesday morning from 9:00 am to 11:30 pm
 - Meeting dates in 2018; 9/19, 10/3, 10/17, 10/31, 11/14, 11/28, 12/12, and 12/26
 - Meeting dates in 2019; 1/9, 1/23, 2/6, 2/20, 3/6, 3/20, 4/3, 4/17, 5/1, 5/15, 5/29, 6/12, 6/26, 8/7, 8/21, and 9/4.
 - iii. The Contractor shall be responsible for providing space and setup for the recurring meetings on 7/10/2019 and 7/24/2019.

- 1 iv. The contractor shall be prepared to make arrangements for meeting space in the event
- 2 that the Owner needs the space for a rental event.
- 3 b. If the Contractor needs progress meeting more frequently any additional scheduling and
- 4 organization shall be the responsibility of the Contractor.
- 5 2. Prepare agenda for meetings including, but not limited to the following:
- 6 a. Safety
- 7 b. Current Schedule, including review of the critical path and 6-week look ahead schedule
- 8 c. Status of project related documentation (Submittals, RFIs, CBs, etc.)
- 9 d. Quality Observation Log and status of correction of deficient items
- 10 e. Project questions and issues from meeting attendees
- 11 f. BPW Administration Check
- 12 g. Other as needed
- 13 h. Status of CORs and COs to be reviewed outside the standard progress meeting time.
- 14 3. Make physical arrangements for meetings. See item 3.3.B.1.iii above and Specification 01 50 00
- 15 Temporary Facilities and Controls for more information and requirements.
- 16 4. GCPM to post meeting agendas to the appropriate libraries on the Project Management Web Site
- 17 (SharePoint) no less than two (2) working days prior to the scheduled meeting. Notify all required
- 18 attendees, applicable parties to the contract, and others affected of the posted meeting agenda.
- 19 5. Preside at meetings.
- 20 6. Route a meeting attendance roster for attendees to sign-in on.
- 21 7. GCPM to record the minutes of the meeting; include significant proceedings and decisions. Post meeting
- 22 minutes to SharePoint no more than two (2) working days after the completed meeting. Meeting
- 23 minutes shall include a scanned copy of the attendance sign-in sheet. Notify all required meeting
- 24 attendees, applicable parties to the contract, and others affected by decisions made at the meetings.
- 25 8. The above requirements do not apply to GC/sub-contractor meetings.
- 26

27 3.4. PRE-INSTALLATION MEETINGS

- 28 A. The GCPM shall schedule and conduct all pre-installation meetings, including mockup reviews, before each
- 29 construction activity that requires coordination with other trades.
- 30 B. The GCPM shall be responsible for the final agenda and meeting minutes.
- 31 C. The GCPM will work with all concerned parties to resolve issues as needed and submit RFI's if necessary.
- 32 D. Required attendance shall be from the list in 3.1.D. above and shall be personnel having a stake in the outcome
- 33 of the installation or knowledge of the system being installed.
- 34 E. In the event the Contractor installs equipment or materials without a pre-installation meeting the Contractor
- 35 shall be solely responsible for removing, replacing, repositioning materials and equipment as instructed by the
- 36 Project Architect or City Project Manager at no additional cost to the City.
- 37

38 3.6 PRE-CONTRACT CLOSEOUT MEETINGS

- 39 A. Two (2) Pre-contract Closeout Meetings shall be held to review the closeout procedures, requirements, and
- 40 contract deliverables.
- 41 1. Pre-contract Closeout Meeting #1 shall be scheduled prior to the 50% Progress Payment Request is being
- 42 requested. This meeting shall discuss items such as closing out QMO reports, providing O&M drafts and
- 43 finals, payroll and Affirmative Action documentation, and other contract deliverables.
- 44 2. Pre-contract Closeout Meeting #2 shall be scheduled prior to the 80% Progress Payment Request is being
- 45 requested. This meeting shall discuss, but not be limited to, the status of scheduling final regulatory
- 46 inspections, cleaning up outstanding QMO's, demonstration and training, attic stock; and finalization
- 47 review of payroll and other related documents.
- 48 B. The GCPM shall schedule, coordinate, and make physical arrangements for both meetings. The GCPM can work
- 49 with the CPM to see if the owner will have space available to conduct these meetings. Minimum scheduling time
- 50 with the owner is 4 weeks out from the date needed.
- 51 C. All of the following shall be required to attend both meetings:
- 52 1. The GCPM and the GC Field superintendent
- 53 2. All Subcontractor Project Managers regardless of the current status of their work.
- 54 a. The GCPM may excuse a Subcontractor PM if he is confident that all contractual requirements for
- 55 closeout by the subcontractor have been completed and/or delivered to the GCPM. The list of
- 56 attendees shall be reviewed and agreed upon with CPM ahead of the meeting.
- 57 b. At the option of these project managers the field supervisors may also attend.

- 1 3. The Project Architect and at least one design consultant from each discipline represented by the plans
- 2 and specifications to address open QMOs, final tests, reports, etc.
- 3 4. The Owner
- 4 5. The CPM
- 5 6. Quality Management staff as needed to address open QMOs, final tests, reports, etc.
- 6 7. The Commissioning Agent
- 7 D. The CPM shall publish an agenda and chair the meeting.
- 8

9 **3.7 OTHER SPECIAL MEETINGS**

- 10 A. The Contractor shall schedule special meetings per the requirements of the LEED Specification, the Project
- 11 Quality Management Plan, the Commissioning Plan and as indicated by other specifications.
- 12 B. Special meetings include but are not limited to the following:
- 13 1. Waste Management Conference
- 14 2. Equipment start up meetings
- 15 3. Testing and balancing meetings
- 16 4. Commissioning meetings
- 17 5. Other meetings as necessitated by the contract documents
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END OF SECTION

SECTION 01 31 23
PROJECT MANAGEMENT WEB SITE (SHAREPOINT)

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6 1.2. SHAREPOINT PROCEDURE OVERVIEW 1
7 1.3. RELATED SPECIFICATIONS 2
8 PART 2 - PRODUCTS 2
9 2.1. SHAREPOINT SYSTEM PRODUCT REQUIREMENTS 2
10 PART 3 - EXECUTION 2
11 3.1. AFTER BID OPENING..... 2
12 3.2. AFTER THE CONTRACT IS SIGNED..... 3
13 3.2. MISCELLANEOUS CONTRACT DOCUMENTATION..... 3
14

PART 1 – GENERAL

1.1. GENERAL DESCRIPTION

- 18 A. The City of Madison (CoM) has established a web based Project Management Tool (PMT) using a Microsoft
19 product called SharePoint (SP).
20 B. The software is used throughout the design, construction and warranty process of major remodels and new
21 construction projects executed as a City of Madison, Board of Public Works project.
22 C. Initially deployed in mid-2013, the SharePoint software has been successfully deployed on several projects, and
23 we continue to modify/update/enhance it on a regular basis.
24

1.2. SHAREPOINT PROCEDURE OVERVIEW

- 26 A. SharePoint is a system of consolidated Document & Form Libraries and Data Lists that assist in performing day to
27 day functions of design/construction management while reducing the use of surface mail, email and email
28 attachments.
29 1. Document libraries store a wide variety of documents in many different formats including but not limited
30 to Word, Excel, PDF, photographs (all popular formats), etc.
31 2. Form Libraries are primarily used when a specific work flow process is needed. The form acts as the
32 cover letter. An example of this would be the Submittal Review Process.
33 3. Data Lists contain consolidated data information that can be generated and stored for other. An example
34 of this would be the Project Directory.
35 4. All libraries are controlled by Permission Groups and Permission Levels.
36 B. A tutorial document on SharePoint will be provided to the General Contractor (GC) who is awarded the contract.
37 Additional training will be provided as needed for the GC and Sub-Contractors (SC) by the CoM.
38 C. SharePoint has predefined work flows that channel automated alerts as documents are uploaded, reviewed, and
39 completed. These workflows are designed for inbound information from the contractor as well as outbound
40 information from the Architectural/Engineer consultant and the Owner.
41 D. The GC will be required to receive email notifications, access the internet to review related documentation and
42 be able to upload/download documentation to the various project libraries.
43 E. The SC's will be required (at a minimum) to receive email notifications and access the internet to review related
44 documentation. Prior to setting up the SharePoint Construction Project Web Site for this contract the GC and
45 CPM shall meet to review all SP workflows, the GC will determine to what level over the minimum requirements
46 the SC's will be involved.
47 F. The figure below shows the general structure of the SharePoint construction documentation categories and the
48 libraries under each category. Related specification numbers are in "()" if applicable. Not all contractors have
49 access to all libraries. For example, sub-contractors do not have access to the GC Partial Pay Apps library.
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Contract Documents	Construction Administration	Construction Progress	LEED Documentation	Quality Control	Construction Closeout
<i>GC Partial Pay Apps (01 29 76)</i>	<i>Change Order Requests (COR Form) (01 26 57)</i>	<i>Schedules (01 32 16)</i>	<i>LEED Documents</i>	<i>Regulatory Inspections</i>	<i>Misc. Closeout Documents</i>
<i>Construction Documents</i>	<i>Change Orders (CO Form) (01 26 63)</i>	<i>Progress Meetings (01 31 19)</i>	<i>Waste Management (01 74 19)</i>	<i>Commissioning Checklists</i>	<i>O & M Manuals (01 78 23)</i>
<i>Regulatory Documents</i>	<i>Construction Bulletins (CB Form) (01 26 46)</i>	<i>Contractor Journal (DJ Form) (01 32 26)</i>		<i>System Performance Tests</i>	<i>Product Warranties /Guarantees (01 78 36)</i>
	<i>Request for Information (RFI Form) (01 26 13)</i>			<i>Quality Management Observation (QMO Form) (01 45 16)</i>	<i>As-Builts (01 78 39)</i>
	<i>Submittals (SD Form) (01 33 23)</i>			<i>Safety and Incident Reports</i>	<i>Attic Stock (01 78 23)</i>
	<i>Substitution Request (SR Form) (01 25 13)</i>			<i>Material Testing & Field Reports</i>	<i>Demonstration and Training (01 79 00)</i>
					<i>Warranty Issues (WI Form) (01 78 23)</i>

1.3. RELATED SPECIFICATIONS

- A. The following specification sections are directly related to the SharePoint system.
 - 1. 01 25 13 Product Substitution Procedures
 - 2. 01 26 13 Request for Information (RFI)
 - 3. 01 26 46 Construction Bulletins (CB)
 - 4. 01 26 57 Change Order Request (COR)
 - 5. 01 26 63 Change Order (CO)
 - 6. 01 29 76 Progress Payment Procedures
 - 7. 01 31 19 Project Meetings
 - 8. 01 32 16 Construction Progress Schedules
 - 9. 01 32 26 Construction Progress Reporting
 - 10. 01 32 33 Photographic Documentation
 - 11. 01 33 23 Submittals
 - 12. 01 45 16 Field Quality Control Procedures

PART 2 - PRODUCTS

2.1. SHAREPOINT SYSTEM PRODUCT REQUIREMENTS

- A. SharePoint is a Microsoft Windows based software that requires no additional software installation, hardware or other special requirements/applications for the users. There are no costs associated with the use of this system.
 - 1. The CoM hosts the SharePoint project websites.
- B. Currently the CoM is using SharePoint 2010.
 - 1. SharePoint works best if the user's computer is running Windows.
 - a. SharePoint does work on Apple based computers; see item 2 below for additional information.
 - b. SharePoint is not an "APP" therefore it will not work on tablets that only run apps.
 - 2. SharePoint works best when used with the latest versions of Internet Explorer (32 bit).
 - a. At this time SharePoint is not compatible with other internet browsers such as Fire Fox, Google Chrome, and Safari.
 - b. Apple computers can download copies of Internet Explorer for free off the internet.

PART 3 - EXECUTION

3.1. AFTER BID OPENING

- A. After bids have been opened, are being approved, and the contract is routing for signatures, the City Project Manager (CPM) will contact the GC to provide the following information.

- 1 1. Project Management Software Tutorial. This tutorial is in a PDF printable format with screen shots and
2 associated instructions on how to access and use the PMT.
- 3 a. Tutorial instructions will include but not be limited to the following:
4 i. Descriptions of various libraries, documents, and forms that will be used throughout the
5 construction project.
6 ii. Uploading procedures for various types of documents including standardized naming
7 conventions.
- 8 b. If needed a tutorial class can be set up for the GC and his/her support staff and all sub-contractors
9 and their support staffs. This can usually be coordinated with the Preconstruction Meeting.
- 10 2. A blank Project Directory in an Excel spread sheet format. The contractor shall provide the following
11 information for GC and SC staffs as indicated on the spreadsheet. This will generally be the Project
12 Manager for the GC as well as the Sub-contractors and the GC Site Supervisor.
13 a. Last Name, First Name
14 b. Company Name
15 c. Email address (valid, work related)
16 d. Work Phone Number (required, include area code)
17 e. Cell Phone Number (not required, include area code)
- 18 3. The GC shall provide the above information for all SC's where the GC is not self-performing the work.
- 19 4. The GC may provide project foreperson information for work being self-performed if he/she so desires.
- 20 B. It is preferred that the GC return the completed Project Directory spread sheet to the CPM as soon as possible to
21 facilitate getting usernames and passwords assigned for all GC and SC personnel.
22 1. All Contractors and support staff who have previously used SharePoint on another project will be able to
23 use their existing username and password provided they have not had a name change, email address
24 change, or have changed employers.
- 25 C. The CPM is responsible for uploading all project directory data into SharePoint and coordinating with CoM
26 Information Technology (CoM-IT) for creating the usernames/ passwords of non-city staff (GC/SC staffs).
- 27 D. All GC/SC staff will be notified through email that usernames/ passwords are available. Generally, usernames
28 are provided in a blanket email and passwords may be sent through individual follow up emails.
29 1. Usernames/passwords may also be given out at the Pre-construction meeting if they have been created
30 by that time.

31
32 **3.2. AFTER THE CONTRACT IS SIGNED**

- 33 A. After the contract has been fully routed, signed, and recorded by the CoM the GCPM may begin uploading
34 construction related documents as they become available. This may include but not be limited to project
35 schedules, submittals, RFI's, and other documents as needed.
- 36 F. All workflows, review of documentation, and general archiving of construction related documentation will be
37 conducted on SharePoint.
38

39 **3.2. MISCELLANEOUS CONTRACT DOCUMENTATION**

- 40 A. SharePoint is only set up to be used by the CPM, CCM, and the PA Design Team for the sole purpose of managing
41 the construction project. It is not intended to be used for the processing of other contract documentation. The
42 following documents related to the execution of the contract will not be part of SharePoint:
43 1. All documentation related to executing the contract, such as:
44 a. Sub-Contractors list
45 b. Affirmative Action documentation
46 c. Bonding documentation
47 d. Documentation associated with payroll verification
48 e. Final documentation associated with closing out the contract
49 2. Any documentation required/generated by ordinance, code or statute, such as;
50 a. Erosion Control inspections
51 b. Building Inspection Department inspections
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55 **END OF SECTION**
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**SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULES**

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4 PART 1 – GENERAL 1
5 1.1. SCOPE 1
6 1.2. RELATED SPECIFICATIONS 1
7 PART 2 – PRODUCTS – THIS SECTION NOT USED 1
8 PART 3 - EXECUTION 1
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10 3.2. 6 WEEK LOOK-OUT SCHEDULES (LOS) 1
11 3.3. PROJECT MANAGEMENT WEB SITE (SHAREPOINT) 2
12

PART 1 – GENERAL

1.1. SCOPE

- 16 A. This specification is to identify various project related schedules associated with indicating construction progress
17 and outlook. The following schedules are the responsibility of the General Contractor (GC).
18 1. Overall Project Schedule (OPS)
19 2. 6 Week Look-Out Schedule (LOS)
20 B. This specification is not intended to include internal schedules generated by the contractors during their
21 planning and execution of the contract.
22

1.2. RELATED SPECIFICATIONS

- 23 A. Section 01 29 76 Progress Payment Procedures
24 B. Section 01 31 23 Project Management Web Site (SharePoint)
25 C. Section 01 31 19 Progress Meetings
26 D. Section 01 74 13 Progress Cleaning
27 E. Section 01 77 00 Closeout Procedures
28 F. Section 01 78 23 Operation and Maintenance Data
29 G. Section 01 78 36 Warranties
30 H. Section 01 78 39 As-Built Drawings
31 I. Section 01 78 43 Spare Parts and Extra Materials
32 J. Section 01 79 00 Demonstration and Training
33 K. Section 01 91 00 Commissioning
34 L. Other specifications within the construction documents that may indicate the need for scheduling any event with
35 Owner, Project Architect, Owner Representatives, including any owner provided equipment.
36
37

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. OVERALL PROJECT SCHEDULE (OPS)

- 43 A. The GC shall prepare an OPS that covers the duration of the contract from the pre-construction meeting through
44 the end of construction to final contract closeout.
45 1. The GC shall review Specification 01 77 00 Closeout Procedures to become familiar with definitions,
46 differences, and requirements for closing out the construction and contract including the association with
47 progress payments.
48 B. The GC shall provide copies and lead a discussion on the OPS during the pre-construction meeting.
49 C. The OPS shall indicate start and end dates of each task associated with the project.
50 D. The OPS shall clearly indicate the critical path of the project.
51 E. The GC shall update the OPS as often as necessary during the duration of the project. Updates will be briefed as
52 needed during bi-weekly progress meetings.
53

3.2. 6 WEEK LOOK-OUT SCHEDULES (LOS)

- 54 A. The GC shall prepare the initial LOS to include detail of daily tasks for the first six (6) weeks of construction for
55 the Pre-construction meeting. The LOS shall be compatible and complimentary to the OPS.
56 B. The GC shall provide copies and lead a discussion on the LOS during the pre-construction meeting.
57

- 1 C. The LOS shall indicate start and end dates of each major task, associated related sub-tasks, and required parallel
- 2 or pre-requisite tasks required to complete the major task on time.
- 3 D. The LOS shall also include identifying and scheduling such events as:
- 4 1. Pre-installation meetings and mock-up review meetings.
- 5 2. Quality management reviews of installations before they are covered.
- 6 3. Owner provided equipment as designated by the contract documents.
- 7 4. Work by others as designated by the contract documents.
- 8 5. Critical submittal dates.
- 9 6. Scheduled dates for testing, owner training, etc.
- 10 7. Milestones designated by other specifications such as pre-closeout meetings, etc.
- 11 E. The GC shall update the LOS prior to each bi-weekly progress meeting to indicate the next 6 weeks of scheduled
- 12 work. Updates will be briefed during each bi-weekly progress meeting.
- 13

14 **3.3. PROJECT MANAGEMENT WEB SITE (SHAREPOINT)**

- 15 A. The GC shall upload all project schedules and updates to the PMWS in an original PDF version of the scheduling
- 16 document. Scans will not be permitted.
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END OF SECTION

**SECTION 01 32 19
SUBMITTALS SCHEDULE**

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8 1.4. SUBMITTAL DEFINITIONS 1
9 1.5. SUBMITTAL REQUIREMENTS 2
10 1.6. ADMINISTRATIVE SUBMITTALS 2
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12 PART 3 - EXECUTION 2
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14 3.2. GENERAL CONTRACTORS RESPONSIBILITIES 3
15 3.3. STAFF REVIEW RESPONSIBILITIES 3
16

PART 1 – GENERAL

1.1. SUMMARY

- 19
20 A. The General Contractor shall submit a complete and comprehensive list of all submittal drawings anticipated
21 during the execution of this contract.
22 B. The GC shall include the Administrative Submittals identified in item 1.6 below and shall be required to upload
23 them to the Project Management Web Site (SharePoint).
24 C. The initial Submittals Schedule shall be based on the original contract documents used at the time of bidding and
25 any posted addenda through awarding of the contract.
26 D. The Submittal Schedule may be appended during the execution of the contract based on amendments to the
27 contract in the form of Change Orders, Construction Bulletins, and other related documents that add, or change
28 the scope of the work.
29

1.2. RELATED SPECIFICATIONS

- 30
31 A. Section 01 29 76 Progress Payment Procedures
32 B. Section 01 31 23 Project Management Web Site (SharePoint)
33 C. Section 01 33 23 Submittals
34 D. Section 01 91 00 Commissioning
35

1.3. RELATED DOCUMENTS

- 36
37 A. The following documents shall be used as the basis for initiating the original Submittals Schedule.
38 1. Drawing documents and specifications (including general provisions) as provided with the bid set
39 documents and any published addenda.
40 B. The following documents shall be used to amend the submittals schedule as needed during the execution of this
41 contract.
42 1. Documents associated with revisions or clarifications to number A.1 above after awarding of the
43 contract, including but not limited to:
44 a. Construction Bulletins
45 b. Approved Change Orders
46

1.4. SUBMITTAL DEFINITIONS

- 47
48 A. Administrative Submittal: Any submittal that may be required by a Division 1 Specification and as noted in
49 Section 1.6 below.
50 B. Critical Path Submittal: Any early submittal that needs a priority review due to early construction use or long
51 lead times where a delay could affect the critical path of the construction schedule
52 C. Submittal: Any material, product, equipment, or general requirement as outlined in this and other specifications
53 that require a favorable review or acceptance prior to proceeding with procuring the item or proceeding with
54 the Work.
55 1. The word "SUBMIT" in specification text does not necessarily mean provide a submittal drawing.
56 a. For example: "Submit copies of all concrete testing reports..." does not mean to provide them as a
57 submittal drawing. Instead these reports should be submitted to the Material Testing & Field
58 Reports Library.

1.5. SUBMITTAL REQUIREMENTS

- A. The GC and all Sub-contractors shall review the construction documents including the specifications of their individual Division or Trade to compile a complete list of all materials, products, or equipment that will require a positively reviewed submittal to be completed prior to procurement and installation.
 - 1. Submittals shall include but not be limited to any of the following that may apply:
 - a. Shop Drawings
 - b. Product Data
 - c. LEED Data
 - d. Assembly Drawings
 - e. Engineered Drawings
 - f. Product Samples
- B. The following items will require an approved submittal, verify with specifications for specific needs and requirements:
 - 1. Contractor certifications for specialized work such as asbestos removal, well drilling, controls, AV, etc.

1.6. ADMINISTRATIVE SUBMITTALS

- A. The GC shall include all of the following Administrative Submittals on the Submittals Schedule.
 - 1. Wage Rates Form, see Specification 00 43 43
 - 2. Contractors Project Directory, see specification 01 31 23
 - a. This should be submitted directly to the CPM before the SharePoint project site is functional.
 - 3. Schedule of Values, see Specification 01 29 73
 - 4. Submittals Schedule, this Specification, see section 3.1 below
 - 5. Photographic Documentation, see Specification 01 32 33
 - 6. Mockups, see Specification 01 43 39
 - 7. Testing Laboratory Services, see Specification 01 45 29
 - 8. Waste Management Plan, see Specification 01 74 19
 - 9. Closeout Requirement Checklist, see Specification 01 77 00
 - 10. Operation and Maintenance Data, see Specification 01 78 23
 - 11. Warranty Checklist, see Specification 01 78 36
 - 12. Spare Parts and Extra Materials, see Specification 01 78 43
 - 13. Demonstration and Training, see Specification 01 79 00
- B. All Administrative Submittals shall be approved prior to requesting Progress Payment Number 1.

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. OVERALL RESPONSIBILITIES OF ALL CONTRACTORS

- A. All contractors shall be responsible for reviewing the drawings and specifications within their Divisions of Work to provide a complete and comprehensive list of submittals to the General Contractor.
- B. Each list shall indicate the title of the submittal, the associated specification of the submittal, whether the submittal can be considered an early/middle/late submittal, the anticipated date the submittal will be provided and the anticipated date the submittal needs to be approved.
- C. Contractors shall be aware that the goals for submittal review by the Architect staff and City staff will be as follows:
 - 1. Submittal review completed in approximately 10 working days.
 - 2. Priority submittals may be returned in less time.
 - a. The GC shall email the PA, CPM, and CCM indicating the reason for requesting the submittal be given priority
 - 3. Additional time may be needed for complex submittals or if re-submittals are required.
 - 4. New submittals shall be given priority over resubmittals.
- D. The general format of the Submittal Schedule shall be tabular as per this example:

<u>Title</u>	<u>Specification</u>	<u>Critical Path (Y or N)</u>	<u>Date provided</u>	<u>Date required</u>	<u>Remarks</u>
Concrete Mix Design	03 30 00	Y	Oct 1, 2014	Oct 15, 2014	
Paint Draw Downs	09 90 00	N	Jan 2, 2015	Jan 20, 2015	

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3.2. GENERAL CONTRACTORS RESPONSIBILITIES

- A. The General Contractor shall be responsible for all of the following:
 - 1. Consolidating all submittal lists from individual contractors into one master list.
 - 2. Reviewing all submitted lists for completeness, timing with the overall contract, etc. The GC shall meet with individual contractors to make changes as necessary.
 - 3. The GC shall upload the final Submittal Schedule to SharePoint for review. See Specification 01 33 23 Submittals for more information on this procedure.
 - 4. Resubmit the schedule as needed after initial reviews have been completed.
- B. The GC shall work with other contractors to amend the Submittals Schedule throughout the execution of the project based on changes and modifications as needed.
- C. The GC and Project Architect shall be responsible for reviewing and briefing the submittal schedule and submittals status at each bi-weekly construction meeting.

3.3. STAFF REVIEW RESPONSIBILITIES

- A. The Project Architect, consulting staff, Commissioning Agent (CxA), Owner, and city staff will review the Submittal Schedule for completeness per the plans and specifications within their divisions of work. The reviewing staff may provide comments as needed. Some examples might include the following:
 - 1. Submittal not required
 - 2. Provide photos of samples with digital submittal
 - 3. Insure one submittal for complete system
 - 4. Append the schedule to include...
 - 5. See Specification <xyz> for additional requirements
- B. The Project Architect and City Project Manager will finalize review comments regarding the Submittal Schedule. Re-submittal of the Submittal Schedule may be required.

END OF SECTION

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SECTION 01 32 23
SURVEY AND LAYOUT DATA

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6 1.2. RELATED SPECIFICATIONS 1
7 1.3. SURVEYOR QUALIFICATIONS 1
8 1.4. QUALITY ASSURANCE 1
9 1.5. SUBMITTALS 2
10 1.6. EXAMINATION 2
11 PART 2 – PRODUCTS – NOT USED 2
12 PART 3 - EXECUTION 2
13 3.1. PRE-CONSTRUCTION OWNER SUPPORT 2
14 3.2. UTILITY LOCATING 2
15 3.3. SURVEY CONTROL AND LAYOUT DATA 2
16 3.4. TOPOGRAPHIC SURVEYING 2
17 3.5. SITE SURVEY AS-BUILT 3
18

PART 1 – GENERAL

1.1. SUMMARY

- 22 A. The purpose of this specification is to set forth the minimal required guide lines to be followed by the General
23 Contractor (GC) and the Land Surveyor (Surveyor) including but not limited to the following:
24 1. Surveyor Professional Requirements
25 2. Horizontal and Vertical Datum Control
26 3. Local Control (if any)
27 4. Electronic File and Data Requirements
28 5. As-Built Documentation Requirements
29 B. When working on any City of Madison project, OSHA standards must be complied with. The Surveyor shall
30 provide appropriate traffic control in accordance to the Manual on Uniform Traffic Control Devices (MUTCD).
31 C. The Surveyor shall be responsible for notifying Diggers Hotline in advance of beginning the field work for this
32 contract.
33

1.2. RELATED SPECIFICATIONS

- 34 A. Section 01 29 76 Progress Payment Procedures
35 B. Section 01 31 23 Project Management Web Site (SharePoint)
36 C. Section 01 33 23 Submittals
37 D. Section 01 78 39 As-Built Drawings
38 E. Section 105.9, Survey Points and Instructions, of the City of Madison Standard Specifications for Public Works
39
40

1.3. SURVEYOR QUALIFICATIONS

- 41 A. The General Contractors, Land Surveyor Sub-Contractor shall meet or exceed the following:
42 1. The Principal Land Surveyor (PLS) shall be licensed to practice in the State of Wisconsin.
43 a. The PLS's license shall be current at the beginning of the contract and the PLS shall maintain an
44 active license throughout the execution of this contract.
45 2. The PLS shall have a minimum of minimum of ten (10) years of field experience on similar projects of
46 scope and size.
47 a. Land Surveyors working under the direction of the PLS shall have a minimum of five (5) years of field
48 experience on similar projects of scope and size.
49 B. The PLS shall be responsible for checking and verifying all work being performed under the PLS's direction during
50 the execution of this contract. This shall include but not be limited to periodic field checks of equipment and
51 survey data for accuracy and compliance with the contract documents.
52
53

1.4. QUALITY ASSURANCE

- 54 A. The PLS shall do all surveying in City of Madison Datum's as follows:
55 1. All Horizontal Control shall be in the Dane County Coordinates (WISCRS), NAD 83(1997) datum, US
56 Survey foot).
57 2. All Vertical Control shall be in NAVD88(1991).
58

- 1 3. Information on PLSS Section Corner Monuments and Tie Sheets can be found on the City Engineering
2 Mapping website http://gis.cityofmadison.com/Madison_PLSS/PLSS_TieSheets.html.

3
4 **1.5. SUBMITTALS**

- 5 A. After initial project setup the PLS shall provide the following information as a Survey Data Submittal for review
6 by the CPM/CCM, and Owner. See Specification 01 33 23 – Submittals for more information.
7 1. Copy of the PLS (and any supporting staff) current State of Wisconsin registration certificate/licenses.
8 2. Digital Survey Submittal on a thumb drive delivered to the CPM/CCM. Submittal Survey shall be on a
9 thumb drive or CD in Auto CAD 2017, MicroStation V8i, or DXF format. Digital Submittal shall be of the
10 project site setup showing all of the following:
11 a. Key features not scheduled for demolition, including but not limited to building corners, roof
12 overhangs, and door locations.
13 b. Location of construction limits fencing.
14 c. Locations of PLSS and/or project control points provided by the Owner.
15 d. Locations of project based control points.
16 3. Printed Survey Submittal shall be the same as item 1 above in PDF format. PDF file shall be formatted to
17 print to scale on 24"x36" sheets as required to show all features with text neatly organized for each item
18 identified. When multiple sheets are used a match line and sheet references shall be required.
19 4. PDF file of the complete level/layer scheme. Scheme shall be in tabular form formatted to 8.5 by 11
20 paper and shall include all of the following:
21 a. Level/layer designation (abbreviation).
22 b. Level/layer designation (full title).
23 c. Feature attribute characteristics (line weight, line style, font, etc.).
24 d. Cell attribute information
25 e. Samples of line styles and cells.

26
27 **1.6. EXAMINATION**

- 28 A. The PLS shall be responsible for verifying all site data including the owner provided local control points (see
29 Section 3.1 below) prior to starting the Work.
30 B. Notify the Project Architect and CPM/CCM immediately if any discrepancies are discovered.

31
32 **PART 2 – PRODUCTS – NOT USED**

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34 **PART 3 - EXECUTION**

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36 **3.1. PRE-CONSTRUCTION OWNER SUPPORT**

- 37 A. The CPM/CCM shall provide the GC/PLS with a digital CAD seed file on or before the Pre-construction meeting.
38 1. Seed file shall be a MicroStation 3D seed file using the datum indicated above. Seed file shall be
39 delivered as a MicroStation V8i or DXF format as requested by the PLS.
40 a. Seed file shall be used as the PLS's initial base file for all future work on this contract.
41 B. The CPM/CCM shall provide the GC/PLS with a digital CAD file and a points text file of existing local Olbrich Park
42 control for the PLS to use in lieu surveying PLSS corner monuments.

43
44 **3.2. UTILITY LOCATING**

- 45 A. The GC and/or PLS shall be responsible for notifying Diggers Hotline for all utility locate requests.
46 1. For the purposes of this contract no marker paint shall be used on paver, paver stone, flag stone, or
47 similar pavement being removed and salvaged for future reuse.
48 2. No paint marker over spray will be permitted on any buildings, pavement, or vegetation that is not being
49 removed. This shall apply to all areas within the public garden areas.

50
51 **3.3. SURVEY CONTROL AND LAYOUT DATA**

- 52 A. The GC and PLS are responsible for all other survey control and layout data required to perform the work in this
53 contract.
54 B. The PLS will not be permitted to create project survey monuments beyond the project limits in the public
55 gardens without prior consent of the CPM/CCM, and Owner.

56
57 **3.4. TOPOGRAPHIC SURVEYING**

- 58 A. The Surveyor may perform the topographic survey with properly calibrated equipment as follows:

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1. Total station, achieving minimum accuracy for well-defined features of +/- 0.1 feet horizontal and +/-0.04 feet vertical at 95% confidence relative to control. "Well defined features" shall include but not be limited to property irons, pavements, trees, landscaping features, buildings, utility locations, and other permanent features.
2. RTK GPS shall be permitted in large open areas, along tree lines, and in brushy areas.

3.5. SITE SURVEY AS-BUILT

- A. See Specification 01 78 39 As-Built Drawings, Section 3.2 for more information on required record site information to be provided prior to contract closeout.
- B. The GC shall be responsible for scheduling the PLS to capture locations and depths of all buried utilities prior to any contractor back filing trenches. The Owner may require missing information to be located and surveyed at the GC's expense.

END OF SECTION

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**SECTION 01 32 26
CONSTRUCTION PROGRESS REPORTING**

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6 1.2. RELATED SPECIFICATION SECTIONS 1
7 1.3. PERFORMANCE AND QUALITY ASSURANCE REQUIREMENTS 1
8 PART 2 – PRODUCTS - THIS SECTION NOT USED 1
9 PART 3 - EXECUTION 1
10 3.1. CONTRACTOR JOURNAL 1
11 3.2. CONSTRUCTION PROGRESS MEETINGS 2
12

PART 1 – GENERAL

1.1. SUMMARY

- 16 A. Daily records of project activities, resources used, weather conditions, and other information related to the
17 ongoing progress of the project are extremely important at all levels of Construction Management.
18 B. Daily records provide the base for weekly progress reports and updating progress schedules.

1.2. RELATED SPECIFICATION SECTIONS

- 21 A. Section 01 31 19 Project Meetings
22 B. Section 01 31 23 Project Management Web Site (SharePoint)
23 C. Section 01 32 23 Photographic Documentation
24

1.3. PERFORMANCE AND QUALITY ASSURANCE REQUIREMENTS

- 26 A. The General Contractor (GC) shall be responsible for all Construction Progress Reporting as outlined in this and
27 other specifications as noted.
28 B. The GC shall maintain daily progress journals on the Project Management Web Site (SharePoint) as outlined in
29 Section 3.1 below.
30 1. Some projects may require weekly journals be kept instead of daily journals. This is at the sole discretion
31 of the City Project Manager (CPM) or the City Construction Manager (CCM). A daily journal will generally
32 be required when the contract has a significant amount of site work. A weekly journal will generally be
33 used when a contract is interior work only.
34

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. CONTRACTOR JOURNAL

- 40 A. The GC shall maintain a journal of daily progress on which Work is performed by any employee or entity for
41 which the GC is responsible. Such reports shall include all relevant data concerning the progress of Work
42 activities the GC and Subcontractors are responsible for and the effect of that activity on the time of
43 performance of the Contract.
44 B. Journal entries shall be made on the Contractor Daily/Weekly Report Form located in the Construction Progress-
45 Contractors Journal Library on the Project Management Web Site (SharePoint). The form consists of the
46 following areas:
47 1. Weather; include temperature, humidity, precipitation, wind and other related information such as
48 significant storm events, times, and details.
49 2. Delays encountered
50 3. Deliveries received or delayed
51 4. Hot issues that need to be addressed
52 5. Safety issues
53 6. Work completed by trade
54 7. Photograph progress and upload to the Photo Library on the Project Management Web Site (SharePoint).
55 8. Other including inspections, testing, etc.
56 9. Space for attaching documents

- 1 C. The Contractor may, with the approval of the CPM/CCM, use their own company form for progress reporting.
2 The company form may be used as an attachment to the SharePoint form but items 1 through 5 in section B
3 above must be filled out on the SharePoint form.
4 D. If applicable the GC shall include schedules of quantities and costs, progress schedules, wage rates, reports,
5 estimates, invoices, records and other data as requested by the CPM/CCM concerning Work performed or to be
6 performed under this Contract if the CPM/CCM determines such information is needed to substantiate Change
7 Order proposals, claims, or to resolve disputes.
8

9 **3.2. CONSTRUCTION PROGRESS MEETINGS**

- 10 A. The GC shall provide a verbal summary of the previous two (2) weeks progress reports at each bi-weekly
11 construction progress meeting.
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15 **END OF SECTION**
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**SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION**

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5 1.1. SCOPE 1
6 1.2. RELATED SPECIFICATION SECTIONS 1
7 1.3. SUBMITTALS 1
8 PART 2 – PRODUCTS 1
9 2.1. DIGITAL CAMERA 1
10 2.1. TIME LAPSE CONSTRUCTION CAMERA (TLCC) 1
11 PART 3 – EXECUTION 2
12 3.1. REQUIREMENTS FOR DIGITAL PHOTOGRAPHS 2
13 3.2. REQUIREMENTS FOR TIME LAPSE PHOTOGRAPHS 2
14 3.3. PROJECT MANAGEMENT WEB SITE (SHAREPOINT) 2
15

16 **PART 1 – GENERAL**

17
18 **1.1. SCOPE**

- 19 A. The General Contractor (GC) shall be required to take weekly digital photographs of interior and exterior
20 construction progress and upload the photos directly to the Project Management Web Site (SharePoint).
21 B. The GC shall be required to provide digital time-lapse photo service of the project exterior construction progress.
22

23 **1.2. RELATED SPECIFICATION SECTIONS**

- 24 A. Section 01 29 76 Progress Payment Procedures
25 B. Section 01 31 23 Project Management Web Site (SharePoint)
26 C. Section 01 32 19 Submittals Schedule
27 D. Section 01 32 33 Submittals
28 E. Section 01 77 00 Closeout Procedures
29

30 **1.3. SUBMITTALS**

- 31 A. The GC shall provide general information on the type of camera being used for interior and exterior digital
32 photographs.
33 1. Information may be written on Contractor’s transmittal sheet.
34 a. Include camera name/type, aspect ratio setting, and average file size
35 b. Provide sample project pictures as part of PDF submittal.
36 B. The GC shall provide sufficient information on the type of time lapse system being used that meets the
37 requirements identified in section 2.2 below.
38

39 **PART 2 – PRODUCTS**

40
41 **2.1. DIGITAL CAMERA**

- 42 A. All digital photographs shall be taken with a good quality digital camera, cell phone, tablet, and other such digital
43 device.
44 B. Digital photographs shall be formatted to achieve a good, clear, and detailed image where the final file size is
45 between 600 KB and 3.0 MB (3000KB).
46

47 **2.1. TIME LAPSE CONSTRUCTION CAMERA (TLCC)**

- 48 A. The TLCC shall be a high quality weather proof camera owned and operated, or leased, by the GC for the
49 duration of this contract with the following minimum capabilities:
50 1. Pan-Tilt-Zoom (PTZ) capable.
51 2. Wireless internet or built in cellular technology capable.
52 a. The use of memory cards will not be permitted.
53 3. Widescreen, high resolution (5-30 MP rating).
54 4. Powered by 120V AC.
55 a. The use of battery packs will not be permitted.
56 5. Web/cloud hosted access to archived photos and video.
57 6. Provides complete time lapse video capability.
58 7. 24/7 service and support for equipment, software, and hosting services.

- 1 B. Approved equipment/services include but are not limited to the following:
2 1. OxBlue Corporation, www.oxblue.com
3 2. EarthCam, www.earthcam.net
4 3. TrueLook, www.truelook.com
5

6 **PART 3 – EXECUTION**
7

8 **3.1. REQUIREMENTS FOR DIGITAL PHOTOGRAPHS**

- 9 A. The GC shall take a minimum of two (2) exterior photographs each week. Exterior photographs will not be
10 required on projects that do not include any exterior work.
11 1. Exterior photos shall be taken from approximately the same location each week for the duration of the
12 project.
13 2. When applicable this requirement shall begin prior to commencing any site work.
14 3. This requirement shall only be applicable when there is exterior work actively being conducted with the
15 project. Periods of inactivity due to weather (winter conditions) do not require a photograph.
16 4. This requirement shall end when the exterior work has been substantially completed.
17 5. This requirement may be suspended due to weather conditions or substantial delays in exterior progress.
18 B. The GC shall take interior photographs each week that document interior construction progress.
19 1. This requirement will begin when exterior wall framing begins.
20 a. When an interior remodeling project includes demolition work interior photos shall be taken
21 during the demolition process.
22 2. Pictures do not need to be taken from the same location each week.
23 3. This requirement shall end when the interior work has been substantially completed.
24 C. Digital photographs shall be properly zoomed in/out, and flash used as needed, to capture a level of detail
25 required to properly show the progress being captured by the photograph.
26 1. Blurry and dark pictures will not be accepted.
27 D. The camera default naming convention is acceptable. The GC does not need to rename or specifically identify
28 pictures with a title.
29 E. All digital photographs shall be saved in a JPEG (.jpg) format and uploaded directly to the SharePoint Project
30 Images Library.
31 1. The GC shall upload the photos to the folder that designates the appropriate construction week and date
32 (beginning Monday date). If no folder exists, contact the CPM/CCM prior to uploading photos.
33

34 **3.2. REQUIREMENTS FOR TIME LAPSE PHOTOGRAPHS**

- 35 A. The GC shall be responsible for all of the following:
36 1. Verify with the CPM/CCM a suitable place for mounting the camera and related equipment prior to
37 installation.
38 2. The complete installation, setup, maintenance, and removal of the camera and related equipment.
39 3. The hosting and access of all photographs and videos taken by the camera during the project.
40 4. Production of a final time lapse video (minimum of 3 minutes in length) of the project provided in a
41 viewable format to the Owner on a thumb drive or CD.
42 B. Time lapse photos shall be taken from the same fixed position at approximately ten (10) minute intervals.
43 1. Time lapse shall start before normal daily activities begin and end after normal daily activities have been
44 completed.
45 a. The GC shall adjust the camera time lapse schedule as needed to accommodate any periods of
46 overtime or weekend work.
47 b. Time lapse shall not be taken during major periods of no activity including night hours, holidays,
48 weather related (winter) inactivity, etc.
49 C. All photos taken during the execution of this contract shall be accessible from a web based service. Archived
50 photos shall be organized by date and time so that they can be easily retrieved and viewed as needed.
51 1. If necessary the GC shall coordinate usernames and passwords for access to the photos. The City of
52 Madison would prefer that the access be generic to accommodate a wide audience.
53

54 **3.3. PROJECT MANAGEMENT WEB SITE (SHAREPOINT)**

- 55 A. The CPM/CCM shall provide weekly progress folders in the Project Images Library on SharePoint.
56 1. Progress folders are labeled with the Construction Week Number and the date for Monday of that week.
57 2. The GC shall notify the CPM/CCM if additional weekly progress folders need to be created.

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- B. The GC shall upload the weekly digital photographs to the appropriate progress folder in the Project Images Library.
- C. Copies of Time Lapse video shall be uploaded to a separate project folder in the Project Images Library prior to Construction Closeout.

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**SECTION 01 33 20
ELECTRONIC MEDIA RELEASE STATEMENT**

In accepting and utilizing any drawings, specification, or other data on any form of electronic media (the "Data") generated and provided by Meyer, Scherer & Rockcastle, Ltd. (MSR) and its Consultants, the user covenants and agrees that all such drawings and data are instruments of service of Meyer, Scherer & Rockcastle, Ltd., and its Consultants, shall retain all common law, statutory law and other rights, including copyrights, and no transfer of rights is intended by this transmittal.

The Data is scaled but are not intended for use in construction. The electronic files submitted by MSR to the undersigned are submitted for use in preparing submittals for the project described above ("Project") only. By accepting and using the Data, you agree to the terms set forth below.

The user further agrees not to use the Data, in whole or in part, for any client, purpose or project other than the Project. MSR and its Consultants are not liable for claims resulting in any way from unauthorized changes made by user or user's reuse of the Data for any other project. User will indemnify and defend MSR and its Consultants from any damage, liability or cost, including reasonable attorneys' fees, arising from any actions on user's part that result in changes or reuse of the Data without the prior written consent of MSR.

The Data is provided without warranties of any kind, including express, implied or statutory warranties of fitness for a particular purpose, merchantability or non-infringement.

MSR and its Consultants take no responsibility for the Data's compatibility with software or hardware used by the recipient. We recommend that the Data be screened for virus contamination prior to its use.

The user warrants that they have to authority to accept these terms on behalf of the use and MSR can rely upon said authority.

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**SECTION 01 33 23
SUBMITTALS**

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8 PART 2 – PRODUCTS –NOT USED 2
9 PART 3 - EXECUTION 2
10 3.1. GENERAL CONTRACTORS PROCEDURES 2
11 3.2. SUBMITTAL REVIEW 3
12 3.3. DESIGN TEAM REVIEW 3
13 3.4. PROJECT ARCHITECTS FINAL REVIEW 3
14

PART 1 – GENERAL

1.1. SUMMARY

- 18 A. The General Contractor (GC) shall be responsible for providing submittals for review of all contractors and sub-
19 contractors as designated in the construction documents. Submittals shall include but not be limited to all of the
20 following:
21 1. Equipment specified and pre-approved in the specification; to ensure quality, construction, and
22 performance specifications have not changed since final design.
23 2. Equipment specified by performance in the specification; to ensure that the intended quality,
24 construction, and performance specified is met by the selected material or product.
25 3. Shop, piece, erection, and other such drawings as indicated in the specifications to ensure all structural,
26 dimensional, and assembly requirements are being met.
27 4. Submittals indicating installation sequencing
28 5. Submittals indicating control sequencing
29 6. Contractor licensing, certification, and other such regulatory documentation when required by a
30 specification.
31 7. Other submittals as may be required by individual specifications.
32 8. The word “SUBMIT” in specification text does not necessarily mean provide a submittal drawing.
33 a. For example: “Submit copies of all concrete testing reports...” does not mean to provide them as a
34 submittal drawing. Instead these reports should be submitted to the Material Testing & Field
35 Reports Library.
36 B. The submittal process shall not be used to determine alternates to specified products or equipment. All
37 considerations shall be reviewed during the bidding process and acceptable alternates shall be acknowledged by
38 addendum prior to the closing of bidding. See bidding instructions for the information on submitting alternates
39 for consideration.
40 C. In the event that a manufacturer has significantly changed a product (discontinued a model, changed dimension
41 or performance data changed available colors, etc.) since bid opening the GC shall submit a Request for
42 Information (RFI) to the Project Architect requesting other approved alternates prior to uploading a digital
43 submittal.
44 D. Contractors and sub-contractors shall be responsible for knowing the submittal requirements of ALL sections
45 within their scope of work under the contract. The Owner reserves the right to request documentation on any
46 materials, equipment, or product being installed where a submittal is not on file. If the material, equipment, or
47 product installed is determined not to meet the intent of the specification the contractor/sub-contractor shall be
48 required to remove and replace the items involved. The GC shall be solely responsible for all costs associated
49 with the removal and replacement.
50

1.2. RELATED REFERENCES

- 52 A. Section 01 29 76 Progress Payment Procedures
53 B. Section 01 31 23 Project Management Web Site (SharePoint)
54 C. Section 01 32 19 Submittals Schedule
55 D. Section 01 32 26 Construction Progress Reporting
56 E. Section 01 91 00 Commissioning
57 F. All Technical Specifications, contract documents, construction drawings, and any published addendums during
58 the bidding process.

- 1 G. All contract documents generated during the execution of the contract including but not limited to Requests for
2 Information (RFI) and Construction Bulletins (CB).
3

4 **1.3. SUBMITTAL REQUIREMENTS**

- 5 A. A completed submittal shall meet the following requirements:
6 1. Digital submittal shall be original PDF of manufacturer's data sheets or high quality color scan of the
7 same.
8 a. Submittals shall not include sales fliers or other similar documents that typically do not provide
9 complete manufacturers data.
10 2. Documents within the PDF submittal shall be printable to a sized sheet no less than 8-1/2 by 11 inches
11 and no larger than 24 by 36 inches.
12 3. At the beginning of each submittal the contractor shall identify the plan reference (WC-1, EF-3, etc.) in
13 RED block letters that the submittal is for.
14 4. Where multiple model numbers appear in a table the contractor shall identify the specific model being
15 submitted by using a RED square, box, or other designation to distinguish the correct model from others
16 on the page.
17 B. A complete submittal will include all information associated with the product or equipment as presented in
18 plans, equipment tables, and specifications. Information shall include but not be limited to the following:
19 1. Dimensional data
20 2. Performance data
21 3. LEED data
22 4. Resource requirements, power, water, waste, etc.
23 5. Clearance and maintenance requirements
24 6. Finish information, colors, textures, etc.
25 7. Warranty information
26 C. Where a submittal includes material samples (carpet, tile, paint draw downs, etc.) the contractor shall do the
27 following:
28 1. The Contractor shall submit the sample(s) as indicated in the specification.
29 2. The Contractor shall include a quality photograph(s) of the product with the digital submittal.
30 Photographs shall meet the following requirements:
31 a. Formatted to be between 500Kb and 1.0 Mb in file size
32 b. Have no glare or flash reflection on the sample
33 c. Sample fills the frame of the photo and shows detail as needed. Include multiple photos from
34 other angles as needed.
35 d. Scanned copies of products or photos are not acceptable.
36 D. Uploaded submittals should be relative and related to a specific written specification.
37 1. Do not upload submittals under a broad category or division (I.E. HVAC 23 00 00). Always upload by the
38 specific specification that identifies a required product or performance to be met.
39 2. Group related items together if the specification is written that way. (I.E. for a LAV submittal include the
40 lave, wall hanger, fittings, and trim as one submittal under LAV-x).
41 3. Submittals shall be grouped and adhere to the divisions in the submittal schedule. Submittals that do not
42 conform to the submittal schedule and/or specification divisions will be rejected for re-submittal.
43 E. The word "SUBMIT" in specification text does not necessarily mean provide a submittal drawing.
44 1. For example: "Submit copies of all concrete testing reports..." does not mean to provide them as a
45 submittal drawing. Instead these reports should be submitted to the Material Testing & Field Reports
46 Library.
47

48 **PART 2 – PRODUCTS –NOT USED**

49
50 **PART 3 - EXECUTION**

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52 **3.1. GENERAL CONTRACTORS PROCEDURES**

- 53 A. All required submittals will be uploaded to the Construction Administration-Submittal Drawings Library on the
54 Project Management Web Site (SharePoint) by the GC.
55 1. The GC shall open a new Submittal Form in the Submittals Drawings Library for each required submittal
56 from the Submittals Schedule.
57 2. Fill in required information on the form that will be used for routing the review and comments.
58 a. When a submittal requires an "expedited" review the GC shall check the PRIORITY check box.

- 1 i. For all submittals checked as PRIORITY the GC shall provide an email directly to the PA,
2 CPM, and CCM indicating the reason for requesting the submittal be given priority.
- 3 3. Attach all documentation as described in Section 1.3 above.
- 4 a. Submit samples under separate cover to the Project Architect when necessary.
- 5 B. The GC shall upload the following Administrative Submittals to the Construction Administration – Submittal
6 Drawings Library within 20 working days of receipt of the City of Madison Start Work Letter. Each Administrative
7 Submittal shall be loaded into the Library individually. All Administrative Submittals shall be approved prior to
8 requesting Progress Payment Number 1.
- 9 1. Wage Rates Form, see Specification 00 43 43
- 10 2. Contractors Project Directory, see specification 01 31 23
- 11 a. This should be submitted directly to the CPM before the SharePoint project site is functional.
- 12 3. Schedule of Values, see Specification 01 29 73
- 13 4. Photographic Documentation, see Specification 01 32 33
- 14 5. Submittals Schedule, this Specification, see section 3.1 below
- 15 6. Mockups, see Specification 01 43 39
- 16 7. Testing Laboratory Services, see Specification 01 45 29
- 17 8. Waste Management Plan, see Specification 01 74 19
- 18 9. Closeout Requirement Checklist, see Specification 01 77 00
- 19 10. Operation and Maintenance Data, see Specification 01 78 23
- 20 11. Warranty Checklist, see Specification 01 78 36
- 21 12. Spare Parts and Extra Materials, see Specification 01 78 43
- 22 13. Demonstration and Training, see Specification 01 79 00
- 23 C. Uploading any submittal indicates that the GC has reviewed and approved the submittal against the contract
24 document requirements.
- 25 D. The GC shall discuss submittal status at all progress meetings and shall monitor submittal review/approval/re-
26 submittal progress so as to not incur delays in the project schedule.
- 27 E. A completed upload of the submittal to SharePoint initiates the review process workflow.
- 28 F. The GC and sub-contractors shall provide re-submittals as required.

3.2. SUBMITTAL REVIEW

- 30 A. The City of Madison’s goal for submittal review process is 10 working days.
- 31 1. The goal of approved priority reviews will be 5 working days.
- 32 2. New submittals shall be given priority over resubmittals.

3.3. DESIGN TEAM REVIEW

- 35 A. Upon completion of the submittal upload by the GC, SharePoint automatically notifies the appropriate
36 Architect/Engineer and Owner Representative, including CxA, by Division/Specification number that there is a
37 submittal for review.
- 38 1. The submittal shall be reviewed internally by the required Architect/Engineer and Owner Representative
39 and CxA in a timely fashion and provide commentary on missing items, incorrect information, or
40 incomplete shop drawings, etc. as needed.
- 41 2. When the internal review is completed SharePoint will notify the Project Architect the submittal is ready
42 for final review.

3.4. PROJECT ARCHITECTS FINAL REVIEW

- 45 A. Upon completion of the internal review the Project Architect shall review all internal review comments, confer
46 with the CPM and CxA as needed and determine the appropriate disposition status for the submittal (approved
47 or resubmit).
- 48 B. The Project Architect shall summarize final internal review comments onto the submittal cover sheet, provide a
49 final disposition of the submittal and update the review status of the submittal to “Complete...” (with or w/o
50 comments) or “Rejected”.
- 51 C. A completed Final Review status initiates SharePoint to notify the GC and appropriate sub-contractor(s) that the
52 review of the submittal has been completed.

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57 **END OF SECTION**
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SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 – GENERAL

- 1.1 [SUMMARY](#)
- 1.2 [DEFINITIONS](#)
- 1.3 [DELEGATED-DESIGN SERVICES](#)
- 1.4 [CONFLICTING REQUIREMENTS](#)
- 1.5 [ACTION SUBMITTALS](#)
- 1.6 [INFORMATIONAL SUBMITTALS](#)
- 1.7 [REPORTS AND DOCUMENTS](#)
- 1.8 [QUALITY ASSURANCE](#)
- 1.9 [QUALITY CONTROL](#)
- 1.10 [SPECIAL TESTS AND INSPECTIONS](#)

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

- 1.1 [TEST AND INSPECTION LOG](#)
- 1.2 [REPAIR AND PROTECTION](#)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. 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, assembly, 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).
- D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and 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. Laboratory Mockups: Full-size physical assemblies constructed and tested at testing facility to verify performance characteristics.
 - 2. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as as part of permanent construction, consisting of multiple products, assemblies, and subassemblies.
 - 3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting.
- E. 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.

- 1 F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory
2 (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary
3 Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and
4 acceptable to authorities having jurisdiction, to establish product performance and compliance with specified
5 requirements.
- 6 G. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant,
7 mill, factory, or shop.
- 8 H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall
9 mean the same as testing agency.
- 10 I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of
11 the Work to guard against defects and deficiencies and substantiate that proposed construction will comply
12 with requirements.
- 13 J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of
14 the Work to evaluate that actual products incorporated into the Work and completed construction comply
15 with requirements. Contractor's quality-control services do not include contract administration activities
16 performed by Architect.

17 **1.3 DELEGATED-DESIGN SERVICES**

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

21 **1.4 CONFLICTING REQUIREMENTS**

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

31 **1.5 ACTION SUBMITTALS**

- 32 A. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required
33 submittals, submit a statement signed and sealed by the responsible design professional, for each product
34 and system specifically assigned to Contractor to be designed or certified by a design professional currently
35 licensed in the State of Wisconsin, indicating that the products and systems are in compliance with
36 performance and design criteria indicated. Include list of codes, loads, and other factors used in performing
37 these services.

38 **1.6 INFORMATIONAL SUBMITTALS**

- 39 A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of
40 written statement of responsibility submitted to authorities having jurisdiction before starting work on the
41 following systems:
- 42 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of
43 Special Inspections.
 - 44 2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special
45 Inspections.
- 46 B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate
47 their capabilities and experience. Include proof of qualifications in the form of a recent report on the
48 inspection of the testing agency by a recognized authority.
- 49 C. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications,
50 inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments,
51 correspondence, records, and similar documents established for compliance with standards and regulations
52 bearing on performance of the Work.
53

1.7 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 - 1. Statement on condition of substrates and their acceptability for installation of product.
 - 2. Statement that products at Project site comply with requirements.
 - 3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 5. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
 - 1. Statement that equipment complies with requirements.
 - 2. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 3. Other required items indicated in individual Specification Sections.

1.8 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. 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, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

- 1 H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who
2 is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that
3 are similar in material, design, and extent to those indicated for this Project.
- 4 I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer
5 who is trained and approved by manufacturer to inspect installation of manufacturer's products that are
6 similar in material, design, and extent to those indicated for this Project.
- 7 J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance
8 with specified requirements for performance and test methods, comply with the following:
9 1. Contractor responsibilities include the following:
10 a. Provide test specimens representative of proposed products and construction.
11 b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to
12 prevent delaying the Work.
13 c. Build laboratory mockups at testing facility using personnel, products, and methods of
14 construction indicated for the completed Work.
15 d. When testing is complete, remove test specimens and test assemblies, mockups (unless
16 indicated to be part of the final work), and laboratory mockups; do not reuse products on
17 Project.
18 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar
19 quality-assurance service to Architect and Commissioning Authority, with copy to Contractor.
20 Interpret tests and inspections and state in each report whether tested and inspected work complies
21 with or deviates from the Contract Documents.
- 22 K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of
23 construction and finish required to comply with the following requirements, using materials indicated for the
24 completed Work:
25 1. Build mockups of size indicated.
26 2. Build mockups in location indicated or, if not indicated, as directed by Architect or Owner.
27 3. Notify Architect and Owner seven days in advance of dates and times when mockups will be
28 constructed.
29 4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be
30 employed to perform same tasks during the construction at Project.
31 5. Demonstrate the proposed range of aesthetic effects and workmanship.
32 6. Obtain Architect's and Owner's approval of mockups before starting corresponding work, fabrication,
33 or construction.
34 a. Allow seven days for initial review and each re-review of each mockup.
35 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the
36 completed Work.
37 8. Demolish and remove mockups when directed unless otherwise indicated.
- 38 L. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual
39 Specification Sections.

40 **1.9 QUALITY CONTROL**

- 41 A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's
42 responsibility. Perform additional quality-control activities, whether specified or not, to verify and document
43 that the Work complies with requirements.
44 1. Engage a qualified testing agency to perform quality-control services.
45 2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or
46 inspection will be performed.
47 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written
48 report, in duplicate, of each quality-control service.
49 4. Testing and inspection requested by Contractor and not required by the Contract Documents are
50 Contractor's responsibility.
51 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they
52 so direct.
- 53 B. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility,
54 provide quality-control services, including retesting and reinspecting, for construction that replaced Work
55 that failed to comply with the Contract Documents.
56

- 1 C. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority, Owner and Contractor
2 in performance of duties. Provide qualified personnel to perform required tests and inspections.
3 1. Notify Architect, Commissioning Authority, Owner and Contractor promptly of irregularities or
4 deficiencies observed in the Work during performance of its services.
5 2. Determine the locations from which test samples will be taken and in which in-situ tests are
6 conducted.
7 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected
8 work complies with or deviates from requirements.
9 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control
10 service through Contractor.
11 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept
12 any portion of the Work.
13 6. Do not perform duties of Contractor.
14 D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to
15 inspect field-assembled components and equipment installation, including service connections. Report
16 results in writing as specified in Section 01 33 00 "Submittal Procedures."
17 E. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to
18 observe and inspect the Work. Manufacturer's technical representative's services include participation in
19 preinstallation conferences, examination of substrates and conditions, verification of materials, observation
20 of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
21 F. Associated Contractor Services: Cooperate with agencies and representatives performing required tests,
22 inspections, and similar quality-control services, and provide reasonable auxiliary services as requested.
23 Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
24 1. Access to the Work.
25 2. Incidental labor and facilities necessary to facilitate tests and inspections.
26 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist
27 agency in obtaining samples.
28 4. Facilities for storage and field curing of test samples.
29 5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
30 6. Security and protection for samples and for testing and inspection equipment at Project site.
31 G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-
32 control services with a minimum of delay and to avoid necessity of removing and replacing construction to
33 accommodate testing and inspection.
34 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

35 **1.10 SPECIAL TESTS AND INSPECTIONS**

- 36 A. Special Tests and Inspections: Engage a qualified testing agency to conduct special tests and inspections
37 required by authorities having jurisdiction and as follows:
38 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and
39 reviewing the completeness and adequacy of those procedures to perform the Work.
40 2. Notifying Architect, Commissioning Authority, Owner, and Contractor promptly of irregularities and
41 deficiencies observed in the Work during performance of its services.
42 3. Submitting a certified written report of each test, inspection, and similar quality-control service to
43 Architect and Commissioning Authority, through Owner with copy to Contractor and to authorities
44 having jurisdiction.
45 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a
46 list of unresolved deficiencies.
47 5. Interpreting tests and inspections and stating in each report whether tested and inspected work
48 complies with or deviates from the Contract Documents.
49 6. Retesting and reinspecting corrected work.

50 **PART 2 - PRODUCTS (Not Used)**
51

1 **PART 3 - EXECUTION**

2 **3.1 TEST AND INSPECTION LOG**

- 3 A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
- 4 1. Date test or inspection was conducted.
- 5 2. Description of the Work tested or inspected.
- 6 3. Date test or inspection results were transmitted to Architect.
- 7 4. Identification of testing agency or special inspector conducting test or inspection.
- 8 B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection
- 9 log for Architect's, Commissioning Authority's, and Owner's reference during normal working hours.
- 10 1. Submit log at Project closeout as part of Project Record Documents.

11 **3.2 REPAIR AND PROTECTION**

- 12 A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged
- 13 construction and restore substrates and finishes.
- 14 1. Provide materials and comply with installation requirements specified in other Specification Sections
- 15 or matching existing substrates and finishes. Restore patched areas and extend restoration into
- 16 adjoining areas with durable seams that are as invisible as possible. Comply with the Contract
- 17 Document requirements for cutting and patching in Section 01 73 00 "Execution."
- 18 B. Protect construction exposed by or for quality-control service activities.
- 19 C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for
- 20 quality-control services.
- 21

END OF SECTION

SECTION 01 42 00
REFERENCES

- 1
2
3 PART 1 – GENERAL
4 1.1 DEFINITIONS
5 1.2 INDUSTRY STANDARDS
6 1.3 ABBREVIATIONS AND ACRONYMS
7 PART 2 – PRODUCTS
8 Not Used
9 PART 3 – EXECUTION
10 Not Used

11 **PART 1 - GENERAL**

12 **1.1 DEFINITIONS**

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

31 **1.2 INDUSTRY STANDARDS**

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

43 **1.3 ABBREVIATIONS AND ACRONYMS**

- 44 A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract
45 Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of
46 Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional
47 Associations of the United States."
48 B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract
49 Documents, they shall mean the recognized name of the entities in the following list.
50 1. AABC - Associated Air Balance Council; www.aabc.com.
51 2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
52 3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
53 4. AASHTO - American Association of State Highway and Transportation Officials;
54 www.transportation.org.
55 5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
56 6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.

- 1 7. ABMA - American Boiler Manufacturers Association; www.abma.com.
- 2 8. ACI - American Concrete Institute; (Formerly: ACI International); www.abma.com.
- 3 9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
- 4 10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
- 5 11. AF&PA - American Forest & Paper Association; www.afandpa.org.
- 6 12. AGA - American Gas Association; www.aga.org.
- 7 13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
- 8 14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
- 9 15. AI - Asphalt Institute; www.asphaltinstitute.org.
- 10 16. AIA - American Institute of Architects (The); www.aia.org.
- 11 17. AISC - American Institute of Steel Construction; www.aisc.org.
- 12 18. AISI - American Iron and Steel Institute; <http://www.steel.org>.
- 13 19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
- 14 20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
- 15 21. ANSI - American National Standards Institute; www.ansi.org.
- 16 22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
- 17 23. APA - APA - The Engineered Wood Association; www.apawood.org.
- 18 24. APA - Architectural Precast Association; www.archprecast.org.
- 19 25. API - American Petroleum Institute; www.api.org.
- 20 26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
- 21 27. ARI - American Refrigeration Institute; (See AHRI).
- 22 28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
- 23 29. ASCE - American Society of Civil Engineers; www.asce.org.
- 24 30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
- 25 31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers;
26 www.ashrae.org.
- 27 32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
- 28 33. ASSE - American Society of Safety Engineers (The); www.asse.org.
- 29 34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
- 30 35. ASTM - ASTM International; www.astm.org.
- 31 36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
- 32 37. AWEA - American Wind Energy Association; www.awea.org.
- 33 38. AWI - Architectural Woodwork Institute; www.awinet.org.
- 34 39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
- 35 40. AWPA - American Wood Protection Association; www.awpa.com.
- 36 41. AWS - American Welding Society; www.aws.org.
- 37 42. AWWA - American Water Works Association; www.awwa.org.
- 38 43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
- 39 44. BIA - Brick Industry Association (The); www.gobrick.com.
- 40 45. BICSI - BICSI, Inc.; www.bicsi.org.
- 41 46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association);
42 www.bifma.org.
- 43 47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
- 44 48. BWF - Badminton World Federation; (Formerly: International Badminton Federation);
45 www.bissc.org.
- 46 49. CDA - Copper Development Association; www.copper.org.
- 47 50. CEA - Canadian Electricity Association; www.electricity.ca.
- 48 51. CEA - Consumer Electronics Association; www.ce.org.
- 49 52. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
- 50 53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
- 51 54. CGA - Compressed Gas Association; www.cganet.com.
- 52 55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
- 53 56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
- 54 57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
- 55 58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
- 56 59. CPA - Composite Panel Association; www.pbmdf.com.
- 57 60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
- 58 61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
- 59 62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
- 60 63. CSA - Canadian Standards Association; www.csa.ca.
- 61 64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
- 62

- 1 65. CSI - Construction Specifications Institute (The); www.csinet.org.
- 2 66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
- 3 67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
- 4 68. CWC - Composite Wood Council; (See CPA).
- 5 69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
- 6 70. DHI - Door and Hardware Institute; www.dhi.org.
- 7 71. ECA - Electronic Components Association; (See ECIA).
- 8 72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
- 9 73. ECIA - Electronic Components Industry Association; www.eciaonline.org.
- 10 74. EIA - Electronic Industries Alliance; (See TIA).
- 11 75. EIMA - EIFS Industry Members Association; www.eima.com.
- 12 76. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
- 13 77. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
- 14 78. ESTA - Entertainment Services and Technology Association; (See PLASA).
- 15 79. EVO - Efficiency Valuation Organization; www.evo-world.org.
- 16 80. FCI - Fluid Controls Institute; www.fluidcontrolsintitute.org.
- 17 81. FIBA - Federation Internationale de Basketball; (The International Basketball Federation);
18 www.fiba.com.
- 19 82. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation);
20 www.fivb.org.
- 21 83. FM Approvals - FM Approvals LLC; www.fmglobal.com.
- 22 84. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
- 23 85. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.;
24 www.floridarroof.com.
- 25 86. FSA - Fluid Sealing Association; www.fluidsealing.com.
- 26 87. FSC - Forest Stewardship Council U.S.; www.fscus.org.
- 27 88. GA - Gypsum Association; www.gypsum.org.
- 28 89. GANA - Glass Association of North America; www.glasswebsite.com.
- 29 90. GS - Green Seal; www.greenseal.org.
- 30 91. HI - Hydraulic Institute; www.pumps.org.
- 31 92. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
- 32 93. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
- 33 94. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
- 34 95. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
- 35 96. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
- 36 97. IAS - International Accreditation Service; www.iasonline.org.
- 37 98. IAS - International Approval Services; (See CSA).
- 38 99. ICBO - International Conference of Building Officials; (See ICC).
- 39 100. ICC - International Code Council; www.iccsafe.org.
- 40 101. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
- 41 102. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
- 42 103. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
- 43 104. IEC - International Electrotechnical Commission; www.iec.ch.
- 44 105. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
- 45 106. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North
46 America); www.ies.org.
- 47 107. IESNA - Illuminating Engineering Society of North America; (See IES).
- 48 108. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
- 49 109. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
- 50 110. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
- 51 111. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
- 52 112. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
- 53 113. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and
54 Automation Society); www.isa.org.
- 55 114. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
- 56 115. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface
57 Fabricators Association); www.isfanow.org.
- 58 116. ISO - International Organization for Standardization; www.iso.org.
- 59 117. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
- 60 118. ITU - International Telecommunication Union; www.itu.int/home.
- 61 119. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
- 62 120. LMA - Laminating Materials Association; (See CPA).

- 1 121. LPI - Lightning Protection Institute; www.lightning.org.
- 2 122. MBMA - Metal Building Manufacturers Association; www.mbma.com.
- 3 123. MCA - Metal Construction Association; www.metalconstruction.org.
- 4 124. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
- 5 125. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
- 6 126. MHIA - Material Handling Industry of America; www.mhia.org.
- 7 127. MIA - Marble Institute of America; www.mhia.org.
- 8 128. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
- 9 129. MPI - Master Painters Institute; www.paintinfo.com.
- 10 130. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
- 11
- 12 131. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
- 13 132. NACE - NACE International; (National Association of Corrosion Engineers International);
14 www.nace.org.
- 15 133. NADCA - National Air Duct Cleaners Association; www.nadca.com.
- 16 134. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
- 17 135. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
- 18 136. NBI - New Buildings Institute; www.newbuildings.org.
- 19 137. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
- 20 138. NCMA - National Concrete Masonry Association; www.ncma.org.
- 21 139. NEBB - National Environmental Balancing Bureau; www.nebb.org.
- 22 140. NECA - National Electrical Contractors Association; www.necanet.org.
- 23 141. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
- 24 142. NEMA - National Electrical Manufacturers Association; www.nema.org.
- 25 143. NETA - InterNational Electrical Testing Association; www.netaworld.org.
- 26 144. NFHS - National Federation of State High School Associations; www.nfhs.org.
- 27 145. NFPA - National Fire Protection Association; www.nfpa.org.
- 28 146. NFPA - NFPA International; (See NFPA).
- 29 147. NFRC - National Fenestration Rating Council; www.nfrc.org.
- 30 148. NHLA - National Hardwood Lumber Association; www.nhla.com.
- 31 149. NLGA - National Lumber Grades Authority; www.nlga.org.
- 32 150. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
- 33 151. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
- 34 152. NRCA - National Roofing Contractors Association; www.nrca.net.
- 35 153. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
- 36 154. NSF - NSF International; www.nsf.org.
- 37 155. NSPE - National Society of Professional Engineers; www.nspe.org.
- 38 156. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
- 39 157. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
- 40 158. NWFA - National Wood Flooring Association; www.nwfa.org.
- 41 159. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
- 42 160. PDI - Plumbing & Drainage Institute; www.pdionline.org.
- 43 161. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association);
44 www.plasa.org.
- 45 162. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
- 46 163. RFCI - Resilient Floor Covering Institute; www.rfci.com.
- 47 164. RIS - Redwood Inspection Service; www.redwoodinspection.com.
- 48 165. SAE - SAE International; www.sae.org.
- 49 166. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
- 50 167. SDI - Steel Deck Institute; www.sdi.org.
- 51 168. SDI - Steel Door Institute; www.steeldoor.org.
- 52 169. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
- 53 170. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
- 54 171. SIA - Security Industry Association; www.siaonline.org.
- 55 172. SJI - Steel Joist Institute; www.steeljoist.org.
- 56 173. SMA - Screen Manufacturers Association; www.smainfo.org.
- 57 174. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
- 58 175. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
- 59 176. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
- 60 177. SPIB - Southern Pine Inspection Bureau; www.spib.org.
- 61 178. SPRI - Single Ply Roofing Industry; www.spri.org.
- 62 179. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.

- 1 180. SSINA - Specialty Steel Industry of North America; www.ssina.com.
- 2 181. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
- 3 182. STI - Steel Tank Institute; www.steeltank.com.
- 4 183. SWI - Steel Window Institute; www.steelwindows.com.
- 5 184. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
- 6 185. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
- 7 186. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
- 8 187. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
- 9 188. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications
10 Industry Association/Electronic Industries Alliance); www.tiaonline.org.
- 11 189. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
- 12 190. TMS - The Masonry Society; www.masonrysociety.org.
- 13 191. TPI - Truss Plate Institute; www.tpinst.org.
- 14 192. TPI - Turfgrass Producers International; www.turfgrassod.org.
- 15 193. TRI - Tile Roofing Institute; www.tilerroofing.org.
- 16 194. UL - Underwriters Laboratories Inc.; www.ul.com.
- 17 195. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
- 18 196. USAV - USA Volleyball; www.usavolleyball.org.
- 19 197. USGBC - U.S. Green Building Council; www.usgbc.org.
- 20 198. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
- 21 199. WASTEC - Waste Equipment Technology Association; www.wastec.org.
- 22 200. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
- 23 201. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
- 24 202. WDMA - Window & Door Manufacturers Association; www.wdma.com.
- 25 203. WI - Woodwork Institute; www.wicnet.org.
- 26 204. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
- 27 205. WWPA - Western Wood Products Association; www.wwpa.org.
- 28 C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract
29 Documents, they shall mean the recognized name of the entities in the following list.
 - 30 1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
 - 31 2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
 - 32 3. ICC - International Code Council; www.iccsafe.org.
 - 33 4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.
- 34 D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other
35 Contract Documents, they shall mean the recognized name of the entities in the following list.
 - 36 1. COE - Army Corps of Engineers; www.usace.army.mil.
 - 37 2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
 - 38 3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
 - 39 4. DOD - Department of Defense; www.quicksearch.dla.mil.
 - 40 5. DOE - Department of Energy; www.energy.gov.
 - 41 6. EPA - Environmental Protection Agency; www.epa.gov.
 - 42 7. FAA - Federal Aviation Administration; www.faa.gov.
 - 43 8. FG - Federal Government Publications; www.gpo.gov/fdsys.
 - 44 9. GSA - General Services Administration; www.gsa.gov.
 - 45 10. HUD - Department of Housing and Urban Development; www.hud.gov.
 - 46 11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division;
47 www.eetd.lbl.gov.
 - 48 12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
 - 49 13. SD - Department of State; www.state.gov.
 - 50 14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The
51 National Academies; www.trb.org.
 - 52 15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory;
53 www.ars.usda.gov.
 - 54 16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
 - 55 17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice;
56 www.ojp.usdoj.gov.
 - 57 18. USP - U.S. Pharmacopeial Convention; www.usp.org.
 - 58 19. USPS - United States Postal Service; www.usps.com.
- 59 E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other
60 Contract Documents, they shall mean the recognized name of the standards and regulations in the
61 following list.
 - 62 1. CFR - Code of Federal Regulations; Available from Government Printing Office;

- 1 www.gpo.gov/fdsys.
- 2 2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA
- 3 Document Services; www.quicksearch.dla.mil.
- 4 3. DSCC - Defense Supply Center Columbus; (See FS).
- 5 4. FED-STD - Federal Standard; (See FS).
- 6 5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
- 7 a. Available from Defense Standardization Program; www.dsp.dla.mil.
- 8 b. Available from General Services Administration; www.gsa.gov.
- 9 c. Available from National Institute of Building Sciences/Whole Building Design Guide;
- 10 www.wbdg.org/ccb.
- 11 6. MILSPEC - Military Specification and Standards; (See DOD).
- 12 7. USAB - United States Access Board; www.access-board.gov.
- 13 8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- 14 F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other
- 15 Contract Documents, they shall mean the recognized name of the entities in the following list.
- 16 1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance
- 17 Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
- 18 2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code;
- 19 www.calregs.com.
- 20 3. CDHS; California Department of Health Services; (See CDPH).
- 21 4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
- 22 5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
- 23 6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
- 24 7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development;
- 25 www.txforestservice.tamu.edu.

26 **PART 2 - PRODUCTS (Not Used)**

27 **PART 3 - EXECUTION (Not Used)**

28 **END OF SECTION**

**SECTION 01 43 39
MOCKUPS**

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PART 1 – GENERAL

1.1. SUMMARY

A. Definition

1. Mockups are field samples constructed, applied, or assembled at the project site for review by the Owner, Owners Representative, Architect and Consultants.
2. Mockups are three dimensional, true scale models that illustrate materials and methods, equipment, workmanship, or location; based on plans, details, and assemblies.

B. Approved mockups establish the standard of quality by which the final work will be judged.

C. Approved mockups shall be properly documented and entered into the Submittal Library on the Project Management Web Site like any other required submittal. See section 3.4 below for more information.

1.2. RELATED SPECIFICATIONS

- | | | |
|----|------------------|---------------------------------|
| A. | Section 01 26 13 | Request for Information (RFI) |
| B. | Section 01 26 46 | Change Bulletin (CB) |
| C. | Section 01 26 63 | Change Order (CO) |
| D. | Section 01 31 19 | Project Meetings |
| E. | Section 01 32 16 | Construction Progress Schedules |
| F. | Section 01 33 23 | Submittals |
| G. | Section 01 45 00 | Quality Control |

1.3. RELATED DOCUMENTS

- A. The following documents shall be used for preparing mockups.
1. All plans, specifications, and details including those derived as revisions (RFI, CB, CO).
 2. Construction Progress Schedules. Mockups shall be done and completed in a timely fashion for review and approval so as to not impact the Contractors project schedule.
 3. Any Manufacturers installation/assembly instructions.

1.4. PERFORMANCE REQUIREMENTS

- A. All Contractors shall be responsible for providing and constructing mockups as specified in their Division of Work in the plans and specifications.
- B. Materials to be used shall be as specified in the construction documents, full sized and properly assembled.
- C. Completed mockups shall be of sufficient size to provide visible detail of all components as needed for the sample.

1.5. QUALITY ASSURANCE

- A. The General Contractor (GC) shall be responsible for coordinating all of the following as needed:
1. Designating the location for the mockup construction
 2. Coordinating the work of all contractors and materials required to complete the mockup
 3. Ensuring that the mockup meets the intent of the construction documents before scheduling the mockup review meeting.

1
2 **PART 2 - PRODUCTS**

3
4 **2.1. MATERIALS**

- 5 A. The materials used in mockups shall be only those materials indicated in the plans, specifications, and favorably
6 reviewed submittals.
7 B. Mockups shall be made of full scale materials as delivered to the project site.
8 C. All materials associated with a particular detail, construction method, manufacturer's installation instructions
9 shall be properly represented and visible in the mockup. This includes but is not limited to finished mortar joints,
10 sealants, backer rods, tie bars, rebar, etc.
11

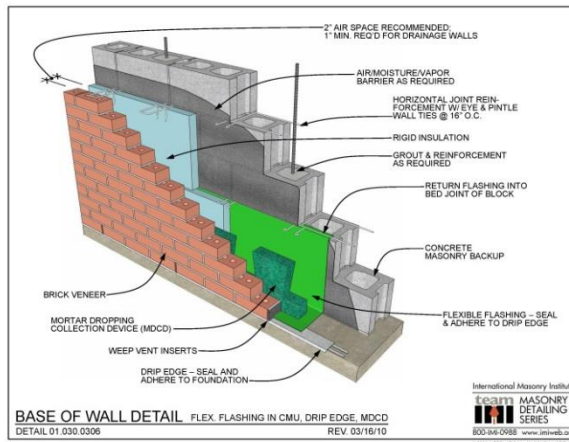
12 **PART 3 - EXECUTION**

13
14 **3.1. REVIEW THE PLANS AND SPECIFICATIONS**

- 15 A. The GC shall review the plans and specifications with all required contractors prior to constructing the mockup.
16 1. Mockups that will be built and remain in place, if favorably reviewed, will be installed in an area easily
17 accessible for review.
18 2. Mockups that will not be built in place or will not remain will be constructed in a space on the project site
19 protected from weather, construction traffic, and other such disturbances until such time as the
20 associated work has been completed.
21 3. Insure all products being represented in the mockup meet the plans, specifications, and any published
22 changes.
23

24 **3.2. MOCKUP CONSTRUCTION**

- 25 A. Mockups shall be of sufficient size to show various material adjacencies, connectivity, patterns, and other such
26 related features.
27 B. Mockups shall be constructed in a layered fashion so that all products being used can be seen and evaluated.
28 C. The construction detail below is an example of a properly layered mockup.
29



- 30
31 D. The GC shall review the project manual and provide a consolidated **MOCKUP LIST** as a submittal for review (see
32 Specification 01 32 19 Submittals Schedule, section 1.6). The mockup list shall indicate the specification number, name,
33 and section number requiring the mockup, and a brief description of the required mockup.
34 1. Example: 32 13 16, Decorative Concrete Pavement, Section 1.4; 5x5 colored pavement, each color
35 E. In addition the GC shall coordinate the following mockups:
36 1. Each type of cavity wall construction
37 2. Each type of construction containing hidden elements
38 3. Each type of roof assembly
39 4. Waterproofing systems
40 5. Air barrier systems
41 6. Flashing assembly
42

1 **3.3. MOCKUP REVIEW**

- 2 A. The General Contractor and all associated Sub-contractors (Contracting Team) shall meet with the Owner,
3 Owners Representative, Architect and Consultants (Design Team) as necessary to review the mock-up.
4 Contractors shall be prepared to answer questions on materials and methods as necessary.
- 5 B. The Contracting and Design Teams shall review the mockup in detail for materials, methods, and workmanship
6 with respect to the intent of the contract documents. Improvements or adjustments shall be discussed as
7 needed.
- 8 C. If the mockup is incomplete or does not show sufficient detail of products and workmanship the General
9 Contractor shall resubmit a new mockup.
- 10 D. Re-submittal of mockups to meet the intent of the contract documents shall be the responsibility of the General
11 Contractor. No Change Orders will be processed for additional time or materials associated with re-submitting a
12 mockup for approval.
- 13 1. In the event that a submitted mockup meets the criteria of the contract documents but does not meet
14 the expectations of the design team and alternative methods or materials are discussed the following
15 procedure shall be used:
- 16 a. Project Architect shall publish a Construction Bulletin (CB) to detail the required/recommended
17 changes.
- 18 b. The GC shall prepare and submit a new mockup.
- 19 E. Required Mockups
- 20 1. **014350:** Two mockups of exterior wall types using WAVB for air barrier system. CMU/stone and
21 stud/copper assemblies. Refer to drawings for mock-up drawings, location and requirements.
- 22 2. **033543:** Before casting concrete, build mockups to verify selections made under Sample submittals and
23 to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build mockups to
24 comply with the following requirements, using materials indicated for the completed Work:
- 25 a. Build mockups in new Mechanical Room, SE corner.
- 26 b. Mockup to be a minimum 4'x4' area in the mechanical room. Owner wants separate review of
27 polish/grind level prior to reviewing finish with sealer and slip-resistance additive.
- 28 c. Demonstrate curing, finishing, and protecting of polished concrete.
- 29 d. Subject to compliance with requirements, approved mockups may become part of the completed
30 Work if undisturbed at time of Substantial Completion.
- 31 e. Provide 3rd party testing of Coefficient of Friction (Slip Resistance):
- 32 3. **042200:** Reinforced Unit Masonry: 4 foot high by 4 foot long, including face and back-up wythes, as well
33 as all accessories. Construct mockup panels for interior and exterior wall construction.
- 34 4. **044313.13:** Mock-Up shall be building corner with window opening illustrating stone veneer and mortar
35 combinations, coursing, and pattern. Mock-up shall be constructed with:
- 36 a. Stone veneer as specified in this Section.
- 37 b. Mortar, grout, wall ties, and weep system specified in this section.
- 38 c. Structural supporting wall as indicated.
- 39 d. Sheathing, Underlayment, Rigid board thermal insulation, and other specified accessories.
- 40 e. Clear sealer and anti-graffiti coating.
- 41 f. Size: approximately 4 feet 1.2 m high by 4 feet 1.2 m long.
- 42 g. Provide slab or foundation support as required by size of mock-up.
- 43 h. Testing: Use water hose to test completed mock-up for water resistance and performance of
44 weep system.
- 45 i. Obtain Architect's approval of mock-up prior to beginning stone veneer installation.
- 46 j. Retain mock-up during construction as quality standard. Completely
- 47 k. Protect accepted mockups from the elements with weather-resistant membrane.
- 48 l. Approval of mockups does not constitute approval of deviations from the Contract Documents
49 contained in mockups unless Architect specifically approves such deviations in writing.
- 50 m. Subject to compliance with requirements, approved mockups may become part of the completed
51 Work if undisturbed at time of Substantial Completion.
- 52 5. **055000:** Blackened steel metal panel (MP-2).
- 53 a. Size: Full height in width module with fastener detailed.
- 54

- 1 6. **057300:** Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic
2 effects, and to set quality standards for fabrication and installation.
 - 3 a. New exterior railing GDRL-1 installation detail at Level 2 roof terrace.
 - 4 b. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and
5 anchorage system components.
 - 6 c. Subject to compliance with requirements, approved mockups may become part of the completed
7 Work if undisturbed at time of Substantial Completion.
- 8 7. **059443:** Provide a mock-up for evaluation of preparation techniques and installation workmanship.
 - 9 a. Locate in areas designated by Architect.
 - 10 b. Size: Full height by 2 modules wide showing end condition.
 - 11 c. Do not proceed with remaining work until workmanship is approved by Architect.
 - 12 d. Rework mock-up as required to produce acceptable work.
 - 13 e. Retain mock-up during construction as quality standard.
 - 14 f. Remove and legally dispose of mock-up when no longer needed.
 - 15 g. Incorporation: Incorporate mock-up into final construction.
- 16 8. **062013:** BRISE-SOLEIL: Two bays or one structural grid width, with steel support, fins and end fascia.
- 17 9. **064116:** Typical millwork unit at classroom east wall with drawers, door in front of drawers, and
18 adjustable shelf cabinet with door.
- 19 10. **074113.19:** Corner of metal panel cladding system MP-1 at external corner, and at window jamb. Base
20 size on at least three typical panel heights per the elevations and one panel width per manufacturer's
21 typical panel sizes for the design intent.
 - 22 a. Provide window head and window sill construction in mockup.
 - 23 b. Approval of mockups does not constitute approval of deviations from the Contract Documents
24 contained in mockups unless Architect specifically approves such deviations in writing.
 - 25 c. Approved mockups may become part of the completed Work if undisturbed at time of Substantial
26 Completion.
- 27 11. **074213.23:** Metal Composite Material Wall Panels with the transition between the two cladding systems.
 - 28 a. Construct infill SMF-2 infill panel mock-up at WDW-1 walls.
- 29 12. **085200:** Full height window wall section with assemblies incorporated to reflect full feature of design
30 anticipated.
 - 31 a. Junction of new wood clad window system WDW-1 with existing brick masonry wall at the existing
32 lobby east elevation. Size to be based on Level 1 window opening height and width at the east
33 elevation, as an in-place mockup to be reviewed prior to completing the work.
 - 34 b. New wood clad fixed and operable window WDW-1 at level 1 classroom including window sill and
35 jamb and head finishes.
 - 36 c. Incorporate a WDW-1 unit into both of the wall mockups. One for stone/CMU/air barrier and
37 another for MP-1/ACM-1/Stud Wall/Air Barrier.
- 38 13. **093013:** floor tile TLFL-2 at Level 1 public lobby to match existing floor tile and grout. Minimum floor
39 mock-up area of 4 feet x 4 feet.
- 40 14. **095426:** A finish mock-up of the ceiling panel. Level 1 classroom: one full width panel between glulam
41 beams.
- 42 15. **096900:** Mockup of AXFL-2: Group of four tiles at edge of lobby.
- 43 16. **265100:** Interior Lighting: Corridor or classroom recessed lighting: one downlight.
- 44 17. **221119:** Greenhouse hose bibb drops and hydrant connections.
- 45 18. **238219:** Recessed fan coil unit, including valving.

3.4. FINAL SUBMITTAL

- 48 A. The field approved mockup shall be submitted by the General Contractor as any other submittal for project
49 documentation purposes. The mockup submittal shall consist of the following:
 - 50 1. Digitally photograph the field approved mockup. Take as many detailed photos as necessary to capture
51 the complexity of the mockup.
 - 52 2. Provide a written summary of the approved mockup. Include all recommended adjustments, level of
53 expected workmanship, and other such detail as discussed during the mockup review.
 - 54 3. Submit the mockup to the Project Management Web Site. See Specification 01 33 23 Submittals for
55 additional information.

END OF SECTION

SECTION 01 43 50
AIR BARRIER SYSTEMS

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16 **PART 1 - GENERAL**

17 **1.1 RELATED DOCUMENTS**

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

20 **1.2 SUMMARY**

- 21 A. Section Includes:
22 1. This section includes administrative and procedural requirements for accomplishing an airtight
23 building enclosure that controls infiltration or exfiltration of air.
24 2. Requirements of this section relate to the coordination between subcontractors required to provide
25 an airtight building enclosure, customized fabrication and installation procedures, not production of
26 standard products.
27 B. Related Sections:
28 1. Section 01 81 13.13 "Sustainable Design Requirements" for quantitative testing.
29 2. Section 07 27 15 "Nonbituminous Self-Adhering Sheet Air Barriers" (**WAVB**).
30 3. Section 07 53 23 "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" (**RFNG-1**).

31 **1.3 DEFINITIONS**

- 32 A. The airtight components of the building enclosure and the joints, junctures and transitions between materials,
33 products, and assemblies forming the air-tightness of the building enclosure are called "the air barrier
34 system". Services include coordination between the trades, the proper scheduling and sequencing of the
35 work, pre-construction meetings, inspections, tests, and related actions, including reports performed by
36 Contractor, by independent agencies, and by governing authorities. They do not include contract
37 enforcement activities performed by Architect.

38 **1.4 PERFORMANCE REQUIREMENTS**

- 39 A. General Performance: The Contractor shall ensure that the intent of constructing the building enclosure with
40 a continuous air barrier system to control air leakage into, or out of the conditioned space is achieved. The
41 air barrier system shall have the following characteristics:
42 1. It shall be continuous, with all joints sealed.
43 2. It shall be structurally supported to withstand positive and negative air pressures applied to the
44 building enclosure.
45 3. Continuity of the air barrier materials and products with joints to provide complete assemblies.
46 4. Continuity of all the enclosure assemblies with joints and transition materials to provide a whole
47 building air barrier system.
48

- 1 B. Connection shall be made between:
2 1. Foundation and walls.
3 2. Walls and windows or doors.
4 3. Different wall systems.
5 4. Wall and roof.
6 5. Wall and roof over unconditioned space.
7 6. Walls, floor and roof across construction, control and expansion joints.
8 7. Walls, floors and roof to utility, pipe and duct penetrations.
9 C. Air Barrier Penetrations: All penetrations of the air barrier and paths of air infiltration / exfiltration shall be
10 made air-tight.
11 D. Compliance Requirements:
12 1. Entire Building: The air leakage of the entire building shall not exceed 0.25 cfm/sf under a pressure
13 differential of 0.3 in. water (1.57psf) (3.2 L/s.m² @ 75 Pa) when tested according to ASTM E 779.
14 2. Assemblies: an air permeance not to exceed 0.04 cfm/ft² under a pressure differential of 0.3 in.
15 water (1.57psf) (0.20 L/s.m² @ 75 Pa) when tested in accordance with ASTM E 1677.
16 3. Materials: Materials used for the air barrier system in the opaque envelope shall have an air
17 permeance not to exceed 0.004 cfm/ft² under a pressure differential of 0.3 in. water (1.57psf) (0.02
18 L/s.m² @ 75 Pa) when tested in accordance with ASTM E 2178.

19 1.5 SUBMITTALS

- 20 A. Field quality-control reports.
21 B. Testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service
22 to the Architect. Contractor shall submit a certified written report, in duplicate, of each inspection, test, or
23 similar service through the Contractor.
24 1. Submit additional copies of each written report directly to the governing authority, when the authority
25 so directs.
26 C. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the
27 following:
28 1. Date of issue.
29 2. Project title and number.
30 3. Name, address, and telephone number of testing agency.
31 4. Dates and locations of samples and tests or inspections.
32 5. Names of individuals making the inspection or test.
33 6. Designation of the Work and test method.
34 7. Identification of product and Specification Section.
35 8. Complete inspection or test data.
36 9. Test results and an interpretation of test results.
37 10. Ambient conditions at the time of sample taking and testing.
38 11. Comments or professional opinion on whether inspected or tested Work complies with Contract
39 Document requirements.
40 12. Name and signature of laboratory inspector.
41 13. Recommendations on retesting.

42 1.6 QUALITY ASSURANCE

- 43 A. Requirement for Contractor to provide an airtight building enclosure is not limited by quality control services,
44 or authorities having jurisdiction and are not limited by provisions of this section.
45 B. Inspection and testing services are required to verify compliance with requirements specified or indicated.
46 These services do not relieve Contractor of responsibility for compliance with Contract Document
47 requirements.
48 1. Qualifications for Air Barrier Testing and Inspection Agencies: Engage Air Barrier inspection and
49 testing service agencies, including independent testing laboratories, that are prequalified and that
50 specialize in the types of air barrier system inspections and tests to be performed.
51 C. Specific quality-control requirements for individual construction activities are specified in the sections of the
52 specifications. Requirements in those sections may also cover production of standard products. It is the
53 Contractor's responsibility to ensure that each subcontractor is adequately and satisfactorily performing the
54 quality assurance documentation, tests and procedures required by each section.
55 D. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that
56 facilitate compliance with Contract Document requirements.
57

- 1 **1.7 PROJECT CONDITIONS**
2 A. Contractor Responsibilities: Contractor shall provide coordination of the trades, and the sequence of
3 construction to ensure continuity of the air barrier system joints, junctures and transitions between materials
4 and assemblies of materials and products, from substructure to walls to roof. Provide quality assurance
5 procedures, testing and verification as specified herein. Facilitate inspections, tests, and other quality-
6 control services specified elsewhere in the Contract Documents and required by authorities having
7 jurisdiction or by the Owner. Costs for these services are included in the Contract Sum.
8 B. Organize preconstruction meetings between the trades involved in the whole building's air barrier system to
9 discuss where each trade begins and ends and the responsibility and sequence of installation of all the air-
10 tight joints, junctures, and transitions between materials, products and assemblies of products specified in
11 the different sections, to be installed by the different trades.
12 C. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a
13 mockup submittal for review.
14 1. Build mock-ups before proceeding with the work, satisfactory to the Architect, of each air-tight joint
15 type, juncture, and transition between products, materials and assemblies.
16 2. Two mockups of exterior wall types using WAVB for air barrier system. CMU/stone and stud/copper
17 assemblies. Refer to drawings for mock-up drawings, location and requirements.
18 D. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services,
19 and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of
20 operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the
21 following:
22 1. Provide access to the Work.
23 2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
24 3. Take adequate quantities of representative samples of materials that require testing or assist the
25 agency in taking samples.
26 4. Deliver samples to testing laboratories.
27 5. Provide security and protection of samples and test equipment at the Project Site.
28 E. Duties of the Testing and Inspection Agency: The independent agency engaged to perform inspections,
29 sampling, and testing of air barrier materials, components and assemblies specified in individual Sections
30 shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing
31 agency shall provide qualified personnel to perform required inspections and tests.
32 1. The agency shall notify the Architect and the Contractor promptly of irregularities or deficiencies
33 observed in the Work during performance of its services.
34 2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract
35 Documents or approve or accept any portion of the Work.
36 3. The agency shall not perform any duties of the Contractor.
37 F. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of
38 delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate
39 inspections and tests.
40 1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar
41 activities.

42 **PART 2 - PRODUCTS (NOT USED)**
43

1 **PART 3 - EXECUTION**

2 **3.1 FIELD QUALITY CONTROL**

- 3 A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
4 B. Tests and Inspections:
5 1. Qualitative Testing and Inspection:
6 a. Daily reports of observations, with copies to the Owner, Contractor and Architect.
7 b. Continuity of the air barrier system throughout the building enclosure with no gaps, holes.
8 c. Structural support of the air barrier system to withstand design air pressures.
9 d. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions and mortar
10 droppings, with mortar joints struck flush, or as required by the manufacturer of the air barrier
11 material.
12 e. Site conditions for application temperature and dryness of substrates.
13 f. Maximum length of exposure time of materials to ultra-violet deterioration.
14 g. Surfaces are properly primed.
15 h. Laps in material are 2 inches minimum, shingled in the correct direction (or mastic applied on
16 exposed edges), with no fishmouths.
17 i. Mastic applied on cut edges.
18 j. Roller has been used to enhance adhesion.
19 k. Measure application thickness of liquid-applied materials to manufacturer's specifications for
20 the specific substrate.
21 l. Materials used for compatibility.
22 m. Transitions at changes in direction, and structural support at gaps.
23 n. Connections between assemblies (membrane and sealants) for cleaning, preparation and
24 priming of surfaces, structural support, integrity and continuity of seal.
25 o. All penetrations sealed.
26 2. Quantitative Tests: Refer to Section 01 81 13.13 – Sustainable Design Requirements for testing,
27 correction and reporting.

28 **3.2 REPAIR AND PROTECTION**

- 29 A. Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and
30 restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section
31 "Cutting and Patching."
32 B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.
33 C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for
34 inspection, testing, or similar services.
35

END OF SECTION

SECTION 01 45 16
FIELD QUALITY CONTROL PROCEDURES

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PART 1 – GENERAL

1.1. SUMMARY

- 23 A. The City of Madison has developed a multi-faceted Quality Management Program that begins with contract
24 signing and runs through contract closeout to ensure the best quality materials, workmanship, and product are
25 delivered for the contracted Work.
- 26 1. Progress Payment Milestones have been created to ensure the contractor is meeting required
27 administrative milestones associated with the progression of the Work and the Contract at the
28 appropriate time.
- 29 2. The Progress Management Web Site (SharePoint) is a Construction Management tool that provides
30 contractors, consultants, and staff a single on-line location for the daily operations and progression of the
31 Work.
- 32 3. The Quality Management Observation (QMO) is an ongoing observation of the construction process as it
33 progresses.
- 34 4. Closeout Procedures have been implemented to assist the Contractor in closing out both the
35 Construction and Administrative aspects of the Contract.
- 36 5. The Completion and Correction List (the Punch List) is intended to be the final summary of corrections
37 required by all contractors to close out the construction portion of the contract.
- 38 B. All contractors shall be required to review the specifications identified in Section 1.2 below, and other related
39 specifications identified therein to become familiar with the terminology and expectations of this City of
40 Madison Public Works contract.
- 41 C. It is the intent of this specification to outline the requirements, expectations, and responsibilities of the General
42 Contractor (GC), Project Architect, and other representatives of the Owner for items of Quality Assurance and
43 Quality Control.
- 44 1. This specification is not intended to conflict with Specification 01 40 00 Quality Requirements or other
45 specifications requiring testing and inspecting services.
- 46 2. This specification does not relieve the GC from any requirements associated with regulatory inspections
47 performed by the City of Madison Building Inspection Unit, or inspectors from other agencies as required
48 by code.
- 49 3. Any testing performed by an Owner’s Representative does not relieve the GC from performing any
50 testing that may be required by the construction documents.
- 51 D. Work identified as not in compliance with the contract documents by the Project Architect, City Project
52 Manager/Construction Manager, Owner, Owner Representatives, Owner Consultants, etc. shall be resolved
53 immediately at the Contractor’s expense.
- 54 1. Unresolved issues will be subject to withholding of progress payment(s) until completed.

1.2. RELATED SPECIFICATION SECTIONS

- 57 A. Section 01 26 13 Request for Information (RFI)
58 B. Section 01 29 76 Progress Payment Procedures

- 1 C. Section 01 31 13 Project Coordination
- 2 D. Section 01 31 23 Project Management Web Site (SharePoint)
- 3 E. Section 01 77 00 Closeout Procedures
- 4 F. Section 01 78 13 Completion and Correction List
- 5 G. Section 01 91 00 Commissioning
- 6

7 **1.3. PERFORMANCE REQUIREMENTS**

- 8 A. All contractors shall be responsible for a proper quality assurance/quality control (QA/QC) program throughout
- 9 the execution of the Work defined within the construction documents, including all recognized construction
- 10 industry standards and all applicable regulatory codes.
- 11 B. The GC shall be responsible for all of the following:
 - 12 1. Monitor the quality of all workmanship, supplies, materials, and products being installed by all
 - 13 contractors and installers to ensure they meet or exceed the minimum requirements set forth by the
 - 14 construction documents.
 - 15 2. Submit a Request for Information (RFI) whenever manufacturers' instructions or referenced standards
 - 16 conflict with the construction documents before proceeding with the Work.
 - 17 3. Ensure that Work requiring special certifications or licensing is being performed by and is being
 - 18 supervised by personnel that meet the appropriate requirements.
 - 19 a. Ensure that all certificates and licenses are current throughout the execution of the project.
- 20 C. The CoM and its representatives shall perform quality assurance and quality control activities throughout the
- 21 execution of this project. This in no way relieves the GC of maintaining an acceptable QA/QC program.
- 22

23 **1.4. QUALITY ASSURANCE**

- 24 A. The GC shall be responsible for the following:
 - 25 1. All materials, equipment, and products shall be new, clean, undamaged, and meet the performance
 - 26 specifications defined within the construction documents including favorably reviewed submittals.
 - 27 a. Any material, equipment, or product that does not meet the requirements of the construction
 - 28 documents shall be removed and replaced, including any adjacent and related work, at the GCs
 - 29 expense.
 - 30 2. All Work shall be performed by persons properly trained and/or qualified to produce workmanship of the
 - 31 quality specified in the construction documents.
 - 32 3. Providing access to updated As-Builts, addenda, submittals, bulletins and other related construction
 - 33 documents at the project site.
- 34 B. The CoM and its representatives may be responsible for any of the following:
 - 35 1. Attend pre-installation meetings
 - 36 2. Attend construction progress meetings
 - 37 3. Review all submittals
 - 38 4. Conduct field visits for QA/QC purposes, provide feedback to the GC and sub-contractors using Quality
 - 39 Management Observation (QMO) reports.
 - 40 5. Review delivered equipment
 - 41 6. Witness equipment installations, startups, testing as specified in other specifications
 - 42

43 **1.5. QUALITY MANAGEMENT OBSERVATION REPORT**

- 44 A. The Quality Management Observation report or QMO is used as a QA/QC tool by those entities responsible for
- 45 QA/QC activities, including but not limited to, the GC, CoM, PA, CX agent, etc.
- 46 B. QMOs are designed to be an early observation of non-conforming construction work before it becomes buried
- 47 by follow on work. As such it is most often used as an "in progress punch list".
- 48 C. QMO forms are part of the Quality Control Library on the Project Management Web Site (SharePoint).
- 49

50 **PART 2 – PRODUCTS - THIS SECTION NOT USED**

51

52 **PART 3 - EXECUTION**

53

54 **3.1. QUALITY MANAGEMENT OBSERVATIONS (QMO)**

- 55 A. The Quality Management Observation (QMO) process acts as an "in progress punch list" for contractors to
- 56 review and correct before the work gets buried and difficult to correct.
 - 57 1. By using the QMO process the City of Madison's goal is to have a zero item punch list prior to the 90%
 - 58 progress payment and owner occupancy.

1 **3.2. QUALITY MANAGEMENT RESPONSIBILITIES**

- 2 A. While making routine progress visits to the construction project the GC, CPM, CxA and A/E, and applicable others
3 shall observe the details of the construction and installations to ensure that the intent of the construction
4 documents is being followed.
- 5 B. If during the progress visit there is a determination of contract non-conformance a QMO report shall be initiated
6 to begin the documentation process.
- 7 1. The GC field superintendent shall be informed immediately of any issue that may cause harm, damage to
8 finished work, or be buried prior to properly filing a QMO report.
- 9 C. To initiate a QMO report:
- 10 1. Open a QMO report in the Quality Control – Quality Management Observation Library in SharePoint.
11 2. Enter the date and time of the field visit
12 2. Provide references to construction documents if any (examples; specification, drawing page, details,
13 approved submittals, RFI, CB, etc.)
14 3. Provide a short title for the observation being made
15 4. Provide a detailed description of the observation being made
16 5. Click the Submit Observation button before closing the form.
- 17 D. Sharepoint will email a notification to the GC that a QMO report has been initiated. The software will also
18 automatically notify the PA, CPM/CCM.
19

20 **3.3. GC ACKNOWLEDGE QMO**

- 21 A. Upon receiving the email indicating that a QMO report has been initiated the GC shall do all of the following:
- 22 1. Review the form in the QMO Library.
23 2. Provide any initial comments or instructions to sub-contractors in the box provided on the report.
24 3. Review the list of contractors/sub-contractors in the list provided. Place a check mark in front of each
25 contractor that he/she wants to review this QMO report.
26 4. Click the GC Acknowledged button.
- 27 B. Sharepoint will email a notification to all of the contractors that have been checked on the list.
28

29 **3.4. RESPONDING TO A QMO**

- 30 A. All contractors receiving email notification of a QMO report shall review the details of the observation.
31 B. The GC shall be responsible for determining the course of action required to remedy the non-conforming issue
32 and shall coordinate and direct the contractor(s) responsible for any work related to the observation.
- 33 C. All contractors assigned to remedy the observation by the GC shall provide follow-up responses on the QMO
34 report as follows:
- 35 1. Open the QMO report on SharePoint.
36 2. In the QMO Tracking Response area enter a description of your follow-up response in the box provided.
37 a. Click "Insert Item" if additional boxes are required.
38 3. Add attachments (pictures) if needed to show the work has been completed.
39 4. Click the SAVE button before closing the form.
- 40 D. The initiator of the QMO report, GC, PA, CPM/CCM and others may have additional comments during the
41 process of doing any corrective actions until the QMO report is closed.
42

43 **3.5. GENERAL CONTRACTORS FOLLOW-UP**

- 44 A. The GC shall inspect the work to ensure that all assigned contractors have remedied the observation to the
45 intent of the construction documents.
- 46 B. The GC shall respond with any additional comments in his/her response box.
- 47 1. If no comments are to be made the GC at a minimum must date the response box to trigger the next
48 work flow.
- 49 C. Click the GC QMO Corrected button before closing the form.
- 50 D. The software will email a notification to the CPM/CCM and the person who initiated the QMO that the issue has
51 been remedied.
52

53 **3.6. QMO CLOSEOUT PROCEDURE**

- 54 A. The CPM/CCM shall review all comments on the QMO report and verify with the initiator of the report that the
55 issue has been remedied to the satisfaction of the contract intent.
- 56 1. If satisfied the CPM/CCM shall close the QMO report.
57 2. If the report is not satisfied the CPM/CCM shall work with the GC and the initiator what actions still need
58 to be taken to satisfy the report.

1 a. The CPM/CCM shall close the report once all concerns with the report are satisfied.

2

3 **3.7. CONSTRUCTION CLOSEOUT**

4 A. The GC shall note that successful close out QMOs are required for construction closeout as follows:

5 1. Certain progress payments as identified in Specification 01 29 76 are contingent QMO reports being
6 properly closed out.

7 2. Specification 01 77 00 defines all construction closeout requirements.

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END OF SECTION

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SECTION 01 45 29
TESTING LABORATORY SERVICES

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14

PART 1 – GENERAL

1.1. REQUIREMENTS INCLUDED

- 18 A. The Contractor shall employ and pay for the services of an independent testing laboratory to perform specified
19 services and testing.
20 B. Testing Laboratory inspection, sampling and testing is required for:
21 1. Section 03 30 00: Cast-In-Place Concrete
22 2. Section 05 12 00: Structural Steel Framing
23 3. Section 05 40 00: Cold-Formed Steel Framing
24 4. Section 31 20 00: Earthwork
25

1.2. RELATED REQUIREMENTS

- 27 A. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or
28 approvals of public authorities.
29 B. Related Requirements Specified in Other Sections:
30 1. Division 22 and 23: Testing of Mechanical Systems
31 2. Division 26: Testing of Electrical Systems
32

1.3. QUALIFICATION OF LABORATORY

- 34 A. Meet “Recommended Requirements of Independent Laboratory Qualification” published by American Council of
35 Independent Laboratories.
36 B. Meet basic requirements of ASTM E 329, “Standards of Recommended Practice for Inspection and Testing
37 Agencies for Concrete and Steel as Used in Construction.”
38 C. Authorized to operate in State in which the Project is located.
39

1.4. LABORATORY DUTIES

- 41 A. Cooperate with Owner, A/E and Contractor; provide qualified personnel after due notice.
42 B. Perform specified inspections, sampling and testing of materials and methods of construction:
43 1. Comply with specified standards.
44 2. Ascertain compliance of materials with requirements of Contract Documents.
45 C. Promptly notify the Owner, A/E and Contractor of observed irregularities or deficiencies of work or products.
46 D. Promptly submit written report of each test and inspection; one copy each to A/E, Consulting Engineer, Owner
47 and Contractor. Each report shall include:
48 1. Date issued.
49 2. Project Title and number.
50 3. Testing laboratory name, address and telephone number.
51 4. Name and signature of laboratory inspector.
52 5. Date and time of sampling or inspection.
53 6. Record of temperature and weather conditions.
54 7. Date of test.
55 8. Identification of product and specification section.
56 9. Location of sample or test in the Project.
57 10. Type of inspection or test.
58 11. Results of tests and compliance with Contract Documents.

- 1 12. Interpretation of test results, when requested by A/E or the Contractor.
2 E. Perform additional tests as required by Owner, A/E or the Contractor.
3
4 **1.5. LIMITATIONS OF AUTHORITY OF TESTING LABORATORY**
5 A. Laboratory is not authorized to:
6 1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
7 2. Approve or accept any portions of the Work other than those portions of the Work scheduled for testing.
8 3. Perform any duties of the Contractor.
9
10 **1.6. CONTRACTOR'S RESPONSIBILITIES**
11 A. Cooperate with laboratory personnel, provide access to Work and to manufacturer's operations.
12 B. Secure and deliver to the laboratory, adequate quantities of representative samples of materials proposed to be
13 used and which require testing. Submit concrete mix designs to A/E for approval prior to pouring concrete.
14 C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes
15 that require control by the testing laboratory.
16 D. Furnish copies of Product test reports as required.
17 E. Furnish incidental labor and facilities:
18 1. To provide access to Work to be tested.
19 2. To obtain and handle samples at the Project site or at the source of the product to be tested.
20 3. To facilitate inspections and tests.
21 4. For storage and curing of test samples.
22 F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and
23 scheduling of tests.
24 G. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's
25 convenience.
26 H. Employ and pay for the services of a separate, equally qualified independent testing laboratory to perform
27 additional inspections, sampling and testing required when initial tests indicate work does not comply with
28 Contract Documents.
29 I. Temporarily halt the progress of the Work when tested materials do not comply with Contract Documents and
30 promptly notify the Owner or his designated representative and A/E.
31 J. Remove and replace at no cost to the Owner, all defective materials discovered upon testing not to comply with
32 Contract Documents, including cost for retesting and re-inspecting replaced Work that failed to comply with the
33 Contract Documents.
34
35 **1.7. SPECIFIC TEST, INSPECTIONS, AND METHODS REQUIRED**
36 A. **Section 03 30 00: Cast-In-Place Concrete**
37 1. Secure sample of aggregates Contractor proposes to use and test for compliance with Specifications.
38 2. Certify compliance with Specifications of cement proposed for use by the Contractor.
39 3. Review and approve the Contractor's proposed concrete mix proportions for the required concrete
40 strengths using materials Contractor proposed to use on the project. Incorporate specified admixtures
41 and not less than amounts of cement specified.
42 4. Perform appropriate laboratory tests, including compression tests of cylinders and slump test to
43 substantiate mix designs.
44 5. Inspect and test materials during concrete work to substantiate compliance with Specifications and mix
45 requirements.
46 a. Testing:
47 i. Sample and test concrete in accordance with ASTM C 31, ASTM C 143, ASTM C 172, and
48 ASTM C 231.
49 ii. Perform slump tests in accord with ASTM C 143 from same concrete batch used for test
50 cylinders and record results and comments on compression test reports.
51 iii. Perform compression tests in accordance with ASTM C39.
52 iv. When air-entrained concrete is used, a minimum of one (1) air content test shall be
53 performed in accordance with ASTM C 231 for each set of test cylinders taken.
54 v. Identify all test cylinders with symbols to indicate location on the job where concrete test
55 was made. Record on project record drawings.
56 vi. Strength tests shall be made for: each day's pour; each class of concrete; each change of
57 supplies or sources; and for each 100 cubic yards of concrete or fraction thereof.

- 1 vii. One slump test shall be made for each set of test cylinders taken following the procedure
2 in ASTM C 143.
- 3 b. Test Cylinders for all Concrete
- 4 i. Each test shall consist of a minimum of four cylinders.
- 5 ii. Make test cylinders in conformity with ASTM C 31.
- 6 iii. After 24 hours three cylinders to be carefully transported to the testing laboratory for
7 moisture curing and one cylinder to be field cured.
- 8 iv. One field cured cylinder to be tested at 7 days and two laboratory cured cylinders to be
9 tested at 28 days. Reserve one cylinder for further testing.
- 10 v. The average of all strength tests representing each class of concrete, as well as the average of
11 any three consecutive strength tests for each class of concrete, shall be equal to or
12 greater than the specified strength.
- 13 vi. If the A/E has reason to believe that cylinder strength tests are not representative of the
14 strength of concrete in place, A/E shall require drilled cores to be cut and tested at the
15 Contractor’s expense. Coring and testing shall be in accordance with ASTM C 42 Standard
16 Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- 17 B. **Section 05 12 00: Structural Steel Framing**
- 18 1. Welding:
 - 19 a. Provide inspection of shop and field welding in accordance with Section 6 of AWS D1.1.
 - 20 b. Visually inspect all welds, perform appropriate non-destructive tests on apparent defective welds.
21 Verify conformance with Specifications.
 - 22 c. Non-destructive testing shall be performed on 20 percent of the total length of all full penetration
23 welds. If a sufficient number of welds are deficient, additional testing may be performed at the
24 discretion of the testing lab, at no cost to Owner.
- 25 2. Bolting:
 - 26 a. Visually inspect all connections for proper number, size and type of bolt.
 - 27 b. Review all bolted connections for compliance with “snug tight” requirements of AISC.
 - 28 c. No Slip-critical (SC) connections/bolts are required for this project.
 - 29 d. Shear Connectors, Headed/Deformed Bar Concrete Anchors:
 - 30 i. Verify pre-production test records for installation of shear connectors, concrete anchors
31 and threaded studs.
 - 32 ii. Shear connectors shall be struck with a hammer. Those not producing a “clean” pinging
33 sound indicative of a fully attached shear connector shall be bent 15 degrees off vertical
34 towards the nearest support by striking with a hammer. If shear connector does not
35 become loose and weld is not broken, it shall be considered acceptable, and shall be left in
36 the bent position. Replace failing shear connectors and test as before.
 - 37 iii. A visual inspection shall be made of shear connectors and headed/deformed bar concrete
38 anchors after installation. If visual inspection reveals that a sound weld and a 360 degree
39 flash has not been obtained, the connector/anchor shall also be tested by bending a
40 minimum of 15 degrees off vertical opposite to the missing weld/flash, irrespective of the
41 results of the “ping” test required for shear connectors. If the connector/anchor does not
42 become loose it shall be considered acceptable and shall be left in this position. Replace
43 failing connector/anchors and inspect as before.
- 44 C. **Section 05 40 00: Cold Formed Steel Framing**
 - 45 1. As directed by A/E, Contractor’s testing agency may inspect the maintenance of a quality control program
46 including spot checking weldments and welding procedures in accordance with AWS standards.
- 47 D. **Section 31 20 00: Soil Compaction Control and Trenching and Backfilling**
 - 48 1. Soils Engineer to be onsite during excavation operation.
 - 49 2. Visually inspect, test, and certify that exposed undisturbed underlying soil is suitable for required footing
50 bearing capacity and placement of fills.
 - 51 3. Maximum and minimum density of fill soil for compaction percentage of relative density and moisture
52 density shall be determined in accordance with ASTM Designation D 1557. Testing agency will test
53 compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937,
54 as applicable.
 - 55 4. Number of tests as follows:
 - 56 a. Subgrade, Undisturbed and Demolition Surfaces: Visual inspection and probe; test if required.
 - 57 b. Interior Fills: One test per 2,500 sq. ft for each two foot or less lift.
 - 58 c. Exterior Fills: One test per 2,500 sq. ft for each two foot or less lift.

1 d. Utility Trenches: One test per 50 lineal feet for each two foot or less lift.

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PART 2 – PRODUCTS – THIS SECTION NOT USED

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PART 3 – EXECUTION – THIS SECTION NOT USED

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END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

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PART 1 – GENERAL

1.1. SUMMARY

- A. This Section includes general procedural requirements for temporary facilities and controls including, but not limited to the following:
1. Temporary Utilities
 2. Telecommunications Services
 3. Temporary Sanitary Facilities
 4. Barriers
 5. Fencing
 6. Exterior Enclosures
 7. Security
 8. Vehicular Access and Parking
 6. Waste Removal
 7. Project Identification
 8. Field Offices

1.2. RELATED SPECIFICATION SECTIONS

- A. Section 01 31 19 Project Meetings
B. Section 01 31 23 Project Management Web Site (SharePoint)
C. Section 01 74 19 Construction Waste Management and Disposal

1.3. QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:
1. Building Code requirements
 2. Health and safety regulations
 3. Utility company regulations
 4. Police, Fire Department and Rescue Squad rules
 5. Environmental protection regulations
 6. Joint Commission - Hospital Accreditation Standards

- 1 B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition
- 2 Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA
- 3 Electrical Design Library "Temporary Electrical Facilities".
- 4 C. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service.
- 5 Install service in compliance with NFPA 70 "National Electric Code".
- 6

7 **1.4. TEMPORARY UTILITIES**

- 8 A. General:
 - 9 1. The existing electrical and water service may be used.
 - 10 a. Electrical Contractor shall extend temporary power from existing building services.
 - 11 b. Use trigger-operated nozzles for water hoses, to avoid waste of water.
 - 12 2. New permanent facilities may be used provided that all facilities are in like new condition upon
 - 13 completion.
- 14 B. Temporary Lighting: Electrical Contractor shall provide temporary lighting with local switching
 - 15 1. Install and operate temporary lighting, minimum of 30 fc, to fulfill security and protection requirements,
 - 16 without operating the entire system, and will provide adequate illumination for all areas of work,
 - 17 including construction operations and traffic conditions.
- 18 C. Temporary Heat: General Contractor shall provide temporary heat required by construction activities, for curing
- 19 or drying of completed installations or protection of installed construction from adverse effects of low
- 20 temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed
- 21 installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition
- 22 required and minimize consumption of energy.
 - 23 1. Heating Facilities: Except where use of the permanent system is authorized, provide vented self-
 - 24 contained LP gas or fuel oil heaters with individual space thermostatic control.
 - 25 a. Use of gasoline-burning space heaters, open flame, or salamander type heating units is
 - 26 prohibited.
- 27 D. Storm Sewer: General Contractor shall be responsible for all temporary measures necessary to keep all storm
- 28 sewer facilities operational until new facilities have been completely installed, tested and accepted. This shall
- 29 include but not be limited to the facility downspout drain pipe system, garden drain tile system, and other storm
- 30 sewer that may currently be piped through the construction zone.
- 31 E. Irrigation Piping: The General Contractor shall work with the Owner to keep the irrigation main operational until
- 32 winterization on or about October 15, 2018.
 - 33 1. Main may be turned off for temporary periods (not to exceed a few hours) or a temporary main may be
 - 34 installed on the surface as needed.
 - 35 2. GC shall be responsible for ensuring exposed piping does not freeze until winterization is completed.
 - 36 3. The irrigation main and all branch piping to the gardens shall be operational again on or about May 15,
 - 37 2019.
- 38

39 **1.5. TELECOMMUNICATIONS SERVICES AND WI-FI**

- 40 A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization through
- 41 construction closeout.
- 42 B. Telecommunications services shall include:
 - 43 1. Windows-based personal computer dedicated to project telecommunications.
 - 44 2. Shared access to the internet via WIFI or similar wireless connection.
 - 45 a. Access must be capable to support minimum of 10 wireless devices.
 - 46 3. Email Account/address dedicated for GC Project Manager of GC Supervisor on site.
- 47 C. The GC shall review the Technology sheets for requirements associated with relocating the existing fiber optic
- 48 line that runs through the existing greenhouse prior to the demolition of the greenhouse structure.
 - 49 1. At the option of the GC new fiber may be run as temporary until the permanent installation can be
 - 50 completed.
 - 51 a. GC shall be responsible for protecting any temporary installation.
 - 52 b. If the temporary installation becomes damaged the GC shall be responsible for repairing any
 - 53 temporary installation at no additional cost to the Owner.
 - 54 2. Existing fiber shall remain active until new/temporary fiber is ready to be connected.
 - 55 3. Minimum of 3 working day notice to Owner before doing reconnection, minimize duration the fiber is
 - 56 down.
 - 57

1 **1.6. TEMPORARY SANITARY FACILITIES**

- 2 A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
3 B. Temporary toilets: Comply with regulations and health codes for the type, number, location, operation, and
4 maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
5 1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide
6 covered waste containers for used material.
7 2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.
8 C. Maintain daily in clean and sanitary condition
9 D. Water: Provide potable water approved by local health authorities

10
11 **1.7. BARRIERS**

- 12 A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be
13 hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from
14 construction operations and demolition.
15

16 **1.8. FENCING**

- 17 A. Construction: Refer to Plan Documents and Specification Section 01 76 00: Fencing Materials and Barricades
18

19 **1.9. EXTERIOR ENCLOSURES**

- 20 A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions
21 and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures
22 identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors
23 with self-closing hardware and locks.
24 B. Contractor shall provide temporary walls in the existing Lobby prior to beginning exterior wall demolition.
25 1. Contractor shall work with the Owner to minimize impact on the use of the Lobby by staff and visitors.
26 2. Temporary wall shall be a sturdy structure. Structure shall be insulated as much as practical for sound
27 and building heat loss.
28 3. Contractor shall work with the Owner to allow wall to be finished in a manner beyond rough carpentry.
29 C. Contractor shall be responsible for providing adequate structure and weatherproofing to protect all open roof
30 areas during roof demolition and re-construction.
31 1. Contractor shall be responsible for rain runoff, snow accumulation loads, and snow removal.
32

33 **1.10. SECURITY**

- 34 A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized
35 entry, vandalism, or theft.
36

37 **1.11. VEHICULAR ACCESS AND PARKING**

- 38 A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for
39 emergency vehicles.
40 B. Owners parking lot is used extensively on a daily basis and heavily during special events. Use of the parking lot
41 will be restricted to only approved locations as noted within this specification.
42 1. See sheet G001 for locations of all of the following:
43 a. Contractors shall park all personal vehicles and contractor vehicles which are not actively used on
44 the job site on Lakeland Avenue. Other residential streets are available as posted. Parking is on a
45 first come first serve basis.
46 2. Reserved area for contractor shop trailer and lay down yard. One row of 12 parking stalls.
47 a. Additional space can be negotiated with the owner on a short term case by case basis.
48 C. Access and haul routes shall be along Sugar Avenue only. Contractors, suppliers and other related vehicles and
49 equipment shall not use the parking lot entrance off of Atwood Avenue or any of the parking lot areas for routing
50 or staging unless actively working in the parking lot.
51 1. Speed limit shall not exceed 5 mph at any time.
52 2. All construction vehicles and equipment shall yield to pedestrians and private vehicles at all times.
53 3. Extremely large vehicles and the backing up of vehicles in and around the parking lot areas shall use
54 ground guides at all times.
55 D. Provide and maintain access to fire hydrants, free of obstructions.
56

57 **1.12. WASTE REMOVAL**

- 58 A. See Section 01 74 19 - Waste Management, for additional requirements.
-

- 1 B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- 2 C. Provide containers with lids. Remove trash from site periodically.
- 3 D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible
- 4 containers; locate containers holding flammable material outside the structure unless otherwise approved by the
- 5 authorities having jurisdiction.
- 6 E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.
- 7 F. Trench type wash out structures for concrete trucks and related concrete equipment will not be permitted on
- 8 this project. Contractor shall provide sturdy, water tight, temporary structures of adequate size and number as
- 9 needed by the Work being conducted. Structures shall be removed, relocated, emptied as needed. Spillage of
- 10 wet concrete, slurry or dried waste will be cleaned immediately and not be buried.
- 11

12 **1.13. PROJECT IDENTIFICATION**

- 13 A. Design, construct, install, maintain, and remove the authorized Temporary Project Sign as indicated in Section 01
- 14 50 00.
- 15 C. No other signs are allowed without Owner permission except those required by law.
- 16

17 **1.14. FIELD OFFICES**

- 18 A. Office: Weather tight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy
- 19 furniture, drawing rack and drawing display table.
- 20 B. Field Office shall be located as noted on sheet G001.
- 21 C. Provide space for Project Meetings with table and chairs to accommodate a minimum of fifteen (15) persons.
- 22 1. The owner is providing space for Progress Meetings (see Section 01 31 19 3.3 for additional information
- 23 and exceptions).
- 24 2. Contractor shall be responsible for providing space for all other meetings.
- 25 D. Provide a minimum of a 40" LCD monitor or other digital projection device to be connected to the computer
- 26 identified in Section 1.4 Telecommunications Services (above), for use during progress meetings in connection
- 27 with reviewing construction progress information posted to the Project Management Web Site (SharePoint)
- 28 (Specification 01 31 23) hosted by the Owner.
- 29 1. The owner is providing the monitor for Progress Meetings (see Section 01 31 19 3.3 for additional
- 30 information and exceptions).
- 31

32 **PART 2 - PRODUCTS**

33

34 **2.1. TEMPORARY PARTITIONS**

- 35 A. Provide dustproof partitions to limit dust and dirt migration and to separate occupied areas from fumes and
- 36 noise.
- 37 1. Non-fire rated partitions, standard
- 38 a. Wood stud framing, 6-mil polyethylene
- 39

40 **2.2. EQUIPMENT**

- 41 A. Temporary Lifts and Hoists: Contractors requiring temporary lifts and hoists shall provide facilities for hoisting
- 42 materials and employees.
- 43 B. Electrical Outlets: Electrical Contractor shall provide properly configured NEMA polarized outlets to prevent
- 44 insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault
- 45 circuit interrupters, reset button and pilot light, for connection of power tools and equipment.
- 46 C. Electrical Power Cords: Contractors requiring power cords shall provide grounded extension cords; use "hard-
- 47 service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate
- 48 lengths of electric cords, if single lengths will not reach areas where construction activities are in progress. Do
- 49 not exceed safe length-voltage ratio.
- 50 D. Lamps and Light Fixtures: Electrical Contractor shall provide general service incandescent lamps of wattage
- 51 required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to
- 52 breakage. Provide exterior fixtures when exposed to moisture.
- 53 E. Heating Units: General Contractor shall provide temporary heating units that have been tested and labeled by
- 54 UL, FM or another recognized trade association related to the type of fuel being consumed.
- 55 F. First Aid Supplies: General Contractor shall provide first aid supplies complying with governing regulations.
- 56 G. Fire Extinguishers: General Contractor shall provide hand-carried, portable UL-rated, fire extinguishers of NFPA
- 57 recommended classes for the exposures, extinguishing agent and size required by location and class of fire
- 58 exposure.

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PART 3 - EXECUTION

3.1. TEMPORARY FIRE PROTECTION

- A. Until fire protection needs are supplied by permanent facilities, General Contractor shall install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses.
- B. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".
- C. Locate fire extinguishers where convenient and effective for their intended purpose.
- D. Store combustible materials in containers in fire-safe locations.
- E. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires.
- F. Prohibit smoking on the premises.
- G. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
- H. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site
- I. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.2. COLLECTION AND DISPOSAL OF WASTE

- A. Collect waste from construction areas and elsewhere daily
- B. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly.
- C. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg. F.
- D. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

3.3. ENVIRONMENTAL PROTECTION

- A. Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result.
- B. Avoid use of tools and equipment which produce harmful noise.
- C. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.4. REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, and materials prior to Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.
- E. Restore new permanent facilities used during construction to specified condition.

END OF SECTION

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SECTION 01 57 19.11
INDOOR AIR QUALITY (IAQ) MANAGEMENT

PART 1 – GENERAL

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Special requirements for Indoor Air Quality (IAQ) management during construction operations.
 - a. Control of emissions during construction.
 - b. Moisture control during construction.
2. Procedures for testing baseline IAQ. Baseline IAQ requirements specify maximum indoor pollutant concentrations for acceptance of the facility.

B. Related Sections:

1. 01 40 00 – Quality Requirements: Meetings and project coordination.

1.2 DEFINITIONS

- A. Definitions pertaining to sustainable development: As defined in ASTM E2114.
- B. Adequate ventilation: Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of particulates, dust, fumes, vapors, or gases.
- C. Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173, requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261. Throughout this specification, hazardous material includes hazardous chemicals.
 1. Hazardous materials include: pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).
- D. Indoor Air Quality (IAQ): The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the relative quality of air in a building with respect to contaminants and hazards and is determined by the level of indoor air pollution and other characteristics of the air, including those that impact thermal comfort such as air temperature, relative humidity and air speed.
- E. Interior final finishes: Materials and products that will be exposed at interior, occupied spaces; including flooring, wall covering, finish carpentry, and ceilings.
- F. Packaged dry products: Materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging; including carpets, resilient flooring, ceiling tiles, and insulation.
- G. Wet products: Materials and products installed in wet form, including paints, sealants, adhesives, special coatings, and other materials which require curing.

1.3 SUBMITTALS

- A. Indoor Air Quality (IAQ) Management Plan: Not less than 10 days before the Pre-construction meeting, prepare and submit an IAQ Management Plan including, but not limited to, the following:
 1. Procedures for control of emissions during construction.
 - a. Identify schedule for application of interior finishes.
 2. Procedures for moisture control during construction.
 - a. Identify porous materials and absorptive materials.
 - b. Identify schedule for inspection of stored and installed absorptive materials.
 3. Revise and resubmit Plan as required by Owner.
 - a. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations.

- 1 B. Product Data:
- 2 1. Submit product data for filtration media used during construction and during operation. Include
- 3 Minimum Efficiency Reporting Value (MERV).
- 4 2. Submit air pressure difference maps for each mode of operation of HVAC.
- 5 3. Material Safety Data Sheets: Submit MSDSs for inclusion in Operation and Maintenance Manual for
- 6 the following products. Coordinate with Section 01 78 23.
- 7 a. Adhesives.
- 8 b. Floor and wall patching/leveling materials.
- 9 c. Caulking and sealants.
- 10 d. Insulating materials.
- 11 e. Fireproofing and firestopping.
- 12 f. Carpet.
- 13 g. Paint.
- 14 h. Clear finish for wood surfaces.
- 15 i. Lubricants.
- 16 j. Cleaning products.
- 17 C. Inspection and Test Reports:
- 18 1. Moisture control inspections.
- 19 2. Moisture penetration testing.
- 20 **1.4 PRECONSTRUCTION MEETING**
- 21 A. After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with
- 22 Owner and Architect to discuss the proposed IAQ Management Plan and to develop mutual understanding
- 23 relative to details of environmental protection.

24 **PART 2 - PRODUCTS (NOT USED)**

25 **PART 3 - EXECUTION**

- 26 **3.1 IAQ MANAGEMENT - EMISSIONS CONTROL**
- 27 A. During construction operations, follow the recommendations in SMACNA IAQ Guidelines for Occupied
- 28 Buildings under Construction, 2nd Edition, 2007, ANSI/SMACNA 008-2008 (Chapter 3).
- 29 B. HVAC Protection:
- 30 1. Seal return registers during construction operations.
- 31 2. Provide temporary exhaust during construction operations.
- 32 3. To the greatest extent possible, isolate and/or shut down the return side of the HVAC system during
- 33 construction. When ventilation system must be operational during construction activities, provide
- 34 temporary filters.
- 35 4. Do not use new HVAC equipment for construction ventilation without prior approval of Architect.
- 36 C. Source Control: Provide low and zero VOC materials as specified.
- 37 D. Pathway Interruption: Isolate areas of work as necessary to prevent contamination of clean or occupied
- 38 spaces. Provide pressure differentials and/or physical barriers to protect clean or occupied spaces.
- 39 E. Housekeeping: During construction, maintain project and building products and systems to prevent
- 40 contamination of building spaces.
- 41 F. Temporary Ventilation: Provide an ACH (air changes per hour) of 1.5 or more and as follows:
- 42 1. Provide minimum 48 hour pre-ventilation of packaged dry products prior to installation. Remove from
- 43 packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources
- 44 and residues. Provide a temperature range of 60 degrees F minimum to 90 degree F maximum
- 45 continuously during the ventilation period. Do not ventilate within limits of Work unless otherwise
- 46 approved by Architect.
- 47 2. Provide adequate ventilation during and after installation of interior wet products and interior final
- 48 finishes.
- 49 3. Provide filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 as determined by
- 50 ASHRAE 52.2 during construction. Coordinate with work of Division 23, Heating Ventilating and Air
- 51 Conditioning (HVAC).
- 52 G. Scheduling: Schedule construction operations involving wet products prior to packaged dry products to the
- 53 greatest extent possible.
- 54

1 H. Flush-Out: After construction ends, prior to occupancy and with all interior finishes installed, perform a
2 building flush-out by supplying a total air volume of 14,000 cu.ft. of outdoor air per sq.ft. of floor area while
3 maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60%.

4 **3.2 IAQ MANAGEMENT - MOISTURE CONTROL**

5 A. Housekeeping:

- 6 1. Keep materials dry. Protect stored on-site and installed absorptive materials from moisture damage.
7 2. Verify that installed materials and products are dry prior to sealing and weatherproofing the building
8 envelope.
9 3. Install interior absorptive materials only after building envelope is sealed and weatherproofed.

10 B. Inspections: Document and report results of inspections; state whether of not inspections indicate
11 satisfactory conditions.

- 12 1. Examine materials for dampness as they arrive. If acceptable to Architect/Owner, dry damp materials
13 completely prior to installation; otherwise, reject materials that arrive damp.
14 2. Examine materials for mold as they arrive and reject materials that arrive contaminated with mold.
15 3. Inspect stored and installed absorptive materials regularly for dampness and mold growth. Inspect
16 weekly,.
17 a. Where stored on-site or installed absorptive materials become wet, notify Architect. Inspect
18 for damage. If acceptable to Architect/Owner, dry completely prior to closing in assemblies;
19 otherwise, remove and replace with new materials.
20 4. Basement: Monitor basement and crawlspace humidity, and dehumidify when relative humidity is
21 greater than 85 percent for more than 2 weeks or at the first sign of mold growth.
22 5. Weather-proofing: Inspect moisture control materials as they are being installed. Include the
23 following:
24 a. Air barrier: Verify air barrier is installed without punctures and/or other damage. Verify air
25 barrier is sealed completely.
26 b. flashing: Verify correct shingling of the flashing for roof, walls, windows, doors, and other
27 penetrations.
28 c. Insulation layer: Verify insulation is installed without voids.
29 d. Roofing: In accordance with ASTM D7186 Standard Practice for Quality Assurance
30 Observation of Roof Construction and Repair.
31 6. HVAC: Inspect HVAC system as specified in Section 01 91 00 – Commissioning, and the following:
32 a. Condensate pans are sloped and plumbed correctly.
33 b. Access panels are installed to allow for inspection and cleaning of coils and ductwork
34 downstream of coils.
35 c. Ductwork and return plenums are air sealed.
36 d. Duct insulation is installed and sealed.
37 e. Chilled water line and refrigerant line insulation are installed and sealed.

38 C. Schedule:

- 39 1. Schedule work such that absorptive materials, including but not limited to porous insulations, paper-
40 faced gypsum board, ceiling tile, and finish flooring, are not installed until they can be protected from
41 rain and construction-related water.
42 2. Weather-proof as quickly as possible. Schedule installation of moisture-control materials, including
43 but not limited to air barriers, flashing, exterior sealants and roofing, at the earliest possible time.

44 D. Testing for Moisture Penetration:

- 45 1. Windows: Test as per ASTM E1105 Test Method for Field Determination of Water Penetration of
46 Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air
47 Pressure Difference; unless otherwise indicated, acceptable upper limits are no leakage for 15
48 minutes.
49 2. Horizontal Waterproofing (not roofing): Test as per ASTM D5957 Standard Guide for Flood Testing
50 Horizontal Waterproofing Installations; acceptable upper limits are no leakage for 15 minutes.
51 3. Exterior Walls:
52 a. Water Leakage: Review as per ASTM E2128 Standard Guide for Evaluating Water Leakage
53 of Building Walls.

54 **END OF SECTION**

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**SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE**

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PART 1 – GENERAL

1.1. SECTION INCLUDES

- A. Project identification sign.

1.2. RESPONSIBILITY

- A. The Contractor shall be solely responsible for all of the following regarding the temporary project sign:
1. Design, including providing submittals for approval prior to construction.
 2. Construction of the sign including all materials, labor, and equipment required for a quality installation.
 3. Installation including all materials, labor, and equipment required for a quality installation.
 4. Maintenance for the duration of the contract, including but not limited to touch-up painting and re-installation to plumb/level.
 5. Sign removal at the completion of the contract including restoration of all landscaping at the sign location as needed.

1.3. QUALITY ASSURANCE

- A. Design sign and supporting structure to withstand 50 mile/hr. wind velocity.
B. Sign Painter: Experienced as a professional sign painter for minimum three years.
C. Finishes, painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.3. SUBMITTALS

- A. See Section 01 33 23 – Submittals for submittal procedures.
B. See Section 01 32 19 – Submittals Schedule for a list of required administrative submittals.
C. Provide complete shop drawing of project identification sign showing sign construction, mounting, and content. Content drawing shall be a high resolution color rendering showing all, lettering, color, structure, sizes, etc. as described in section 2.2 below.

PART 2 - PRODUCTS

2.1. SIGN MATERIALS

- A. Structure and Framing: New, wood, structurally adequate.
B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4" thick, standard large sizes to minimize joints.
C. Rough Hardware: Galvanized

2.2. PROJECT IDENTIFICATION SIGN

- A. Project Identification Signs are governed by ordinance GMO 31.044(1)(d)3. as follows:
1. Project Signs. Temporary signs on private property, describing a construction or improvement project, including the name of contractors, architects, engineers, investors, owners, and occupants; and displayed only while the project is under construction and valid building permits are in force.

- 1 a. Maximum Net Area: Total signage shall not exceed thirty-two (32) square feet in Group 1
- 2 districts, one-hundred forty-four (144) square feet in all other districts. Square footage may be
- 3 divided.
- 4 b. Maximum Height: Eight (8) feet in Group 1 districts, ten (10) feet in all other districts.
- 5 c. Setback: Ten (10) feet.
- 6 d. Number of Signs: One (1) per street frontage in the Group 1 districts.
- 7 e. Illumination: No.
- 8 B. Project signs are exempt from sign permits.
- 9 C. This project site is zoned as Parks and Recreation which is a Group 2 district.
- 10 a. The owner prefers to minimize the impact of the project sign for this project to a maximum of 64
- 11 square feet.
- 12 i. Two (2) signs of 30-40 square feet each.
- 13 ii. Signs to be connected in a "V" orientation as shown on sheet G001 of the plan set.
- 14 iii. Both signs to be identical
- 15 iv. The maximum height for this project shall be 7'-0" above existing grade
- 16 B. The content for this project sign shall include:
- 17 1. Project title as indicated on the Contract Documents.
- 18 2. Full color project rendering from high resolution image as furnished by Architect.
- 19 3. Owner Logos; City of Madison, City of Madison Parks Division, Olbrich Botanical Gardens, Olbrich
- 20 Botanical Society.
- 21 4. Name and logo of Architect.
- 22 5. Name and Logo of Prime Contractor.

PART 3 - EXECUTION

3.1. DESIGN, CONSTRUCTION, AND INSTALLATION

- 27 A. Within 30 days of the Start Work Letter the Contractor shall:
- 28 1. Design and submit for approval a rendering and shop drawings of the project sign.
- 29 2. Construct the project sign, and deliver it to the project site.
- 30 a. If required all joints shall be butt joints.
- 31 3. Erect the sign at the designated location.
- 32 a. Install all mounting posts and bracing. Posts shall be plumb and not exceeding the specified
- 33 height.
- 34 b. Securely anchor signs plumb and level to the posts.
- 35 c. Restore the area to match the surrounding soft scape (grass, mulch, etc.).

3.2. MAINTENANCE

- 38 A. Contractor shall be responsible for maintaining the sign as needed for the duration of the project. This shall
- 39 include but not be limited to the following:
- 40 1. Touching up graphics as needed when caused by chipping, fading, graffiti, etc.
- 41 2. Ensuring the sign is securely mounted to its structure, remains braced, and is level and plumb.

3.3. REMOVAL

- 44 A. The contractor shall remove the sign, framing supports, and foundations at completion of project and restore the
- 45 area to match the surrounding soft scape (grass, mulch, etc.).

END OF SECTION

**SECTION 01 60 00
PRODUCT REQUIREMENTS**

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PART 1 – GENERAL

1.1. SUMMARY

- 22 A. The purpose of this specification is to provide general guidelines and responsibilities related to the receiving,
23 handling, and storage of all materials and products from arrival on the job site through installation.
24 1. Immediate inspection of delivered goods means a timely replacement if damaged.
25 2. Proper storage helps prevent damage and loss by weather, vandalism, theft, and job site accidents.
26 3. Proper storage helps with job site performance and safety.
27 2. Proper handling helps prevent damage and job site accidents.
28 B. Each Contractor shall be directly responsible for the receiving, handling, and storage of all materials and
29 products associated with the Work of their Division or Trade.
30 C. Each Contractor responsible for Work associated with Owner provided materials or products shall be responsible
31 for the receiving, handling and storage of the material/product as outlined in Section 3.8 below.
32

1.2. RELATED SPECIFICATIONS

- 34 A. Parts of this specification will reference articles within “The City of Madison Standard Specifications for Public
35 Works Construction”.
36 1. Use the following link to access the Standard Specifications web page:
37 <http://www.cityofmadison.com/business/pw/specs.cfm>
38 a. Click on the “Part” chapter identified in the specification text. For example if the specification
39 says “Refer to City of Madison Standard Specification 210.2” click the link for Part II, the Part II
40 PDF will open.
41 b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you
42 to the referenced text.
43 c. City Standard Detail Drawings (SDD) may be located from the index in Part VIII.
44 B. Section 01 57 21 Indoor Air Quality
45 C. Section 01 74 13 Progress Cleaning
46 D. Section 01 76 00 Protecting Installed Construction
47 E. Other Divisions and Specifications that may address more specifically the requirements for the storage and
48 handling of materials and products associated Work of other Divisions or Trades.
49

1.3. QUALITY ASSURANCE

- 51 A. The GC shall be responsible for ensuring that these minimum storage and handling requirements are met by all
52 contractors on the project site including but not limited to the following:
53 1. Receiving deliveries of materials, products, and equipment.
54 a. Inspect all deliveries upon arrival for damage, completeness, and compliance with the
55 construction documents.
56 i. Deliveries shall remain in original packaging or crates, shipping manifest shall be kept with
57 the delivery and the packaging shall have visible identification of the items within the
58 packaging.

- 1 b. Immediately report any damaged products or equipment to the GC, begin arrangements for
2 immediate replacement.
- 3 c. Materials or equipment that have been damaged, are incomplete, or do not comply with the
4 construction documents shall not be permitted to be installed.
- 5 2. All materials and products shall be stored within the designated limits of the project site. Only store the
6 amount of material necessary for upcoming operations so as not to interfere with other construction
7 activities and access to Work by the Owner and Architect. Any offsite storage shall be at the expense of
8 the contractor storing the material or product. All offsite storage requirements shall comply with this
9 specification. All offsite storage of materials is subject to Owner Representative Quality Management
10 review at any time.
- 11 3. Large storage containers may be used but shall be weather tight, securable, placed on concrete blocks,
12 timbers, or jack stands and shall be level.
- 13 4. When lifting equipment is required the equipment rating shall be greater than the loading requirements
14 of the item being lifted. In addition, all of the following shall apply as necessary:
- 15 a. Only designated and/or designed lift points shall be used.
- 16 b. Large items shall have tag lines and handlers at all times during lifting operations.
- 17 c. Lift at multiple points as needed to prevent bending.
- 18 5. Materials and products stored inside of the structure shall comply with all of the following:
- 19 a. Storage shall not be allowed to impede the flow of work in progress.
- 20 b. Storage shall not be allowed to hide completed work from review and inspections.
- 21 c. Storage shall not exceed the design loads of the structural components it is being stored upon.
- 22 6. All materials and products shall be stored according the manufacturers minimum recommended
23 requirements. All of the following shall be considered before storing any product or material:
- 24 a. Dust and dirt
- 25 b. Moisture and humidity, including rain and snow
- 26 c. Excessive temperatures, direct sun, etc.
- 27 d. Product or material weight and size
- 28 e. Potential for breakage
- 29 f. Product incompatibility with other products such as corrosiveness, chemical reactions,
30 flammability, etc.
- 31 g. Product or material value and replacement cost
- 32 7. The Contractor shall be responsible for providing fully functional tarps or plastic wrap, to protect
33 materials and products from the weather. All coverings shall be free of large holes and tears, and shall be
34 tied, strapped, or weighted down to resist blowing.
- 35 8. The Contractor shall be responsible for any temporary heating, cooling, or other utility requirement that
36 may be associated with the storage of a material or product.
- 37 9. The Contractor shall be responsible for securing materials and products of value such as copper, A/V
38 equipment, etc. Such items shall be stored in securable shipping container, job trailer, or other such
39 storage devices. Containers shall be kept secured when not in use.
- 40 B. The GC shall inspect the job site daily to ensure that all products and materials stay weather tight and are
41 secured against vandalism or theft as required by this specification.
- 42 C. The Owners Representative may at any time request improvements regarding storage of any material or product
43 being provided under these construction documents.
- 44

45 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

46

47 **PART 3 - EXECUTION**

48

49 **3.1. GENERAL CONTRACTOR REQUIREMENTS**

- 50 A. Designate material storage and handling areas as needed including all of the following:
- 51 1. Designate specific areas of the site for delivery and storage of materials to be used during the execution
52 of the Work.
- 53 2. Designated areas shall not be located so as to interfere with the installation of any Work including Work
54 by others such as the installation of utilities or the maintenance of existing utilities. This shall include not
55 storing items in active utility easements as designated by the site plan.
- 56 B. Arrange for openings in the building as needed to allow delivery and installation of large items. Openings shall
57 be appropriately sized to include the use of booms, slings, and other such lifting devices that may be larger than
58 the item being installed.

- 1 1. When openings are required in completed Work (new or existing) the GC shall be responsible for
2 providing an appropriate opening and for restoring the opening to the original or better condition upon
3 completion. Restoration shall be weather tight and complete.
4 C. Repeated moving and handling of items being stored shall not be allowed. The GC shall be responsible for any
5 damage and replacement because of mishandling or excessive handling.
6

7 **3.2. BULK MATERIAL**

- 8 A. Bulk material such as sand, gravel, top soil and other types of fill shall be stored away from the construction area
9 and shall be stock piled as follows:
10 1. All bulk material shall be piled safely and efficiently in as small an area as practical. Only store the
11 amount of material necessary for upcoming operations so as not to interfere with other construction
12 activities and access to Work by the Owner and Architect.
13 2. All stock piles shall have silt fence/sock properly installed around the perimeter to prevent erosion and
14 loss of material. Refer to City of Madison Standard Specification Section 210.1(f) and other related
15 specification or details.
16 3. Fine grained material shall be protected with tarps to prevent blowing. Tarps shall be weighted or staked
17 to stay in place.
18 B. Bulk material such as brick, concrete block, stone, and other palletized materials shall be stored on original
19 shipping pallets until ready for use.
20

21 **3.3. DRY PACKAGED MATERIAL**

- 22 A. Dry packaged material such as cement, mortar, etc. shall be stored on pallets, on slightly elevated ground or
23 clear stone pad to keep water away from the base of the material being stored. Protect from moisture.
24

25 **3.4. STRUCTURAL AND FRAMING MATERIAL**

- 26 A. All structural and framing material shall be stored in an organized manner arranged by type, size and dimension.
27 Materials shall be stored on pallets or timbers as necessary and shall not be allowed to lie directly on the ground.
28 B. Long and heavy items shall be supported at several points to prevent bending and warping.
29

30 **3.5. EQUIPMENT**

- 31 A. Equipment delivered to the site shall be stored away from all construction activities until the item can either be
32 moved inside or properly installed.
33 B. Equipment shall be stored on slightly elevated ground or clear stone pad to keep water away from the base of
34 the equipment.
35

36 **3.6. FINISH PRODUCTS**

- 37 A. Finish products such as flooring, tile, counters, lockers, toilets, partitions, lighting, and other similar items should
38 not be delivered and stored until the structure has been enclosed, is weather tight, temperature controlled, and
39 the contractor is ready for such items to be installed.
40 1. Storage of finished products outside for any length of time shall not be allowed.
41 B. Products that cannot be stored inside the structure shall be stored in secured containers or job trailers until such
42 time as they are ready to be installed.
43 C. Products with a high potential for breakage such as glass, mirrors, tiles, toilet fixtures, etc. shall be stored with
44 additional protection as necessary such as but not limited to the following:
45 1. Store in original shipping containers until ready for installation.
46 2. Do not store in high traffic areas.
47 3. Shield with other materials such as cardboard, plywood, or similar products.
48

49 **3.7. DUCTWORK, PIPING, AND CONDUIT**

- 50 A. All piping and conduit shall be stored horizontally unless otherwise specified by the manufacturer or Division and
51 Trade Specifications.
52 1. Do not store directly on grade.
53 2. Cover metal pipes and tubes to prevent rust and corrosion, allow ventilation to prevent condensation.
54 3. Whenever possible use pipe stands for storing pipe and conduit to prevent tripping and rolling hazards.
55 B. All ductwork shall be stored horizontally or vertically as necessary unless otherwise specified by the
56 manufacturer or Division and Trade Specifications.
57 1. During storage, both ends of each duct shall be protected with plastic sheathing to prevent dust and dirt
58 from getting inside the duct. Sheathing shall be sufficiently taped to the duct.

- 1 2. After installation, free/open ends shall remain protected with taped plastic sheathing and or temporary
2 filters as specified by division or Trade specifications.
3

4 **3.8. OWNER PROVIDED, CONTRACTOR INSTALLED EQUIPMENT**

- 5 A. Section 3.8.A. shall apply to all equipment being provided to any contractor directly from the Owner for
6 installation under the contract.
7 1. The Owner or Owners Representative shall do the following:
8 a. Inspect all deliveries upon receipt and notify manufacturer of any issues directly.
9 b. Review the received shipment with the contractor.
10 i. Only provide products or materials to the contractor that were not damaged through
11 shipping or handling.
12 ii. Confirm missing products or materials and anticipated delivery schedule if known.
13 2. The Contractor responsible for the installation of Work associated with Owner provided materials or
14 products shall “take ownership” and provide safe and secure storage and handling as previously
15 described within this specification.
16 i. The Contractor shall be liable for the repair or replacement of any material or product
17 damaged after taking ownership of the product from receipt through final acceptance.
18 B. Section 3.8.B. shall apply to all equipment being provided by the Owner but shipped directly to any sub-
19 contractor or the project site for installation under the contract.
20 1. The GC and/or Contractor responsible for the Work associated with the Owner provided materials or
21 products shall do the following:
22 a. Inspect all deliveries upon receipt and notify the Owner or Owners Representative of any issues
23 directly.
24 i. Owner or Owners Representative shall notify manufacturer of any issues directly.
25 b. Review the received shipment with the Owner or Owners Representative
26 i. Confirm missing products or materials and anticipated delivery schedule if known.
27 2. The Contractor shall “take ownership” and provide safe and secure storage and handling as previously
28 described within this specification.
29 i. The Contractor shall be liable for the repair or replacement of any material or product
30 damaged after taking ownership of the product from receipt through final acceptance.
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32
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35

END OF SECTION

**SECTION 01 71 23
FIELD ENGINEERING**

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12 PART 3 – EXECUTION – THIS SECTION NOT USED 2
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PART 1 – GENERAL

1.1. REQUIREMENTS INCLUDED

- A. The Contractor shall provide and pay for field engineering services required for the Project:
1. Land surveying services required to execute the Work, including but not limited to building addition location and layout, location and layout of pavements, and all proposed site improvements.
 - a. The Contractors Surveyor shall be required to use owner provided datum and control points throughout the execution of this contract. See Section 01 32 23 Survey & Layout Data for more information.
 2. Verification of existing building dimensions, elevations, and relationship to proposed additions.
 3. Professional Engineering services to execute Contractor’s construction methods.
 4. Registered Professional Engineer in the State of Wisconsin to determine the load capacity of the existing structure for use of Contractors temporary facilities, equipment, lifts, machinery, material storage, etc.

1.2. RELATED REQUIREMENTS

- A. Conditions of the Contract

1.3. RELATED SPECIFICATIONS

- A. Section 01 32 23 Survey & Layout Data
B. Section 01 78 29 Final Site Survey

1.4. PROCEDURES

- A. A property survey has been prepared for the Owner and has been bound with Contract Drawings. Surveys shall describe physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. If information is incomplete, notify Owner to furnish additional information. Verify easement locations, front, side, and rear yard restrictions, if any; and property line locations. Verify control points, and establish bench marks. Locate and layout roads, walks, parking areas and all civil structures and all proposed site improvements.
- B. Verify locations of underground services, utilities, structures, etc. which may be encountered or affected by the Work.

1.5. PROJECT SURVEY REQUIREMENTS

- A. Using datum, the lot lines and present levels have been established as indicated on the Drawings. Other grades, lines, levels and benchmarks, shall be established and maintained by the Contractor, who shall be responsible for them. As work progresses, the Contractor shall layout on forms and floor, the locations of all partitions, walls and fix column centerlines as a guide to all trades. The Contractor shall make provision to preserve property line stakes, benchmarks, or datum point. If any are lost, displaced or disturbed through neglect of any Contractor, Contractor’s agents or employee, the Contractor responsible shall pay the cost of restoration.
- B. Establish lines and levels, locate and layout, by instrumentation and similar appropriate means, additions, column locations, floor levels, stakes for walks, etc.
- C. Provide data to all Subcontractors for their use as applicable.
- D. From time to time, verify layouts by same methods.

1.6. RECORDS

- A. Maintain a complete and accurate log of all control and survey work as it progresses.

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PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

SECTION 01 73 00
EXECUTION

- 1
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- 3 PART 1 – GENERAL
- 4 1.1 SUMMARY
- 5 1.2 INFORMATIONAL SUBMITTALS
- 6 1.3 QUALITY ASSURANCE
- 7 PART 2 – PRODUCTS
- 8 2.1 MATERIALS
- 9 PART 3 – EXECUTION
- 10 3.1 EXAMINATION
- 11 3.2 PREPARATION
- 12 3.3 CONSTRUCTION LAYOUT
- 13 3.4 FIELD ENGINEERING
- 14 3.5 INSTALLATION
- 15 3.6 PROGRESS CLEANING
- 16 3.7 STARTING AND ADJUSTING
- 17 3.8 PROTECTION OF INSTALLED CONSTRUCTION

18 **PART 1 - GENERAL**

19 **1.1 SUMMARY**

- 20 A. Section includes general administrative and procedural requirements governing execution of the Work
- 21 including, but not limited to, the following:
- 22 1. Construction layout.
- 23 2. Field engineering and surveying.
- 24 3. Installation of the Work.
- 25 4. Cutting and patching.
- 26 5. Progress cleaning.
- 27 6. Starting and adjusting.
- 28 7. Protection of installed construction.
- 29 B. Related Requirements:
- 30 1. Section 01 10 00 "Summary" for limits on use of Project site.
- 31 2. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record
- 32 Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing
- 33 defective work, and final cleaning.
- 34 3. Section 09 91 00 "Commissioning".

35 **1.2 INFORMATIONAL SUBMITTALS**

- 36 A. Certificates: Submit certificate signed by professional engineer licensed in the State of Wisconsin certifying
- 37 that location and elevation of improvements comply with requirements.
- 38 B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous
- 39 materials, for hazardous waste disposal.

40 **1.3 QUALITY ASSURANCE**

- 41 A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction
- 42 where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- 43 B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction
- 44 elements.
- 45 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations
- 46 and details of cutting and await directions from Architect before proceeding. Shore, brace, and
- 47 support structural elements during cutting and patching. Do not cut and patch structural elements in
- 48 a manner that could change their load-carrying capacity or increase deflection.
- 49 2. Operational Elements: Do not cut and patch operating elements and related components in a
- 50 manner that results in reducing their capacity to perform as intended or that results in increased
- 51 maintenance or decreased operational life or safety.
- 52 3. Other Construction Elements: Do not cut and patch other construction elements or components in a
- 53 manner that could change their load-carrying capacity, that results in reducing their capacity to
- 54 perform as intended, or that results in increased maintenance or decreased operational life or
- 55 safety.
- 56

- 1 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of
2 cutting and patching. Do not cut and patch exposed construction in a manner that would, in
3 Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that
4 has been cut and patched in a visually unsatisfactory manner.
5 C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written
6 recommendations and instructions for installation of products and equipment.

7 **PART 2 - PRODUCTS**

8 **2.1 MATERIALS**

- 9 A. General: Comply with requirements specified in other Sections.
10 1. For projects requiring compliance with sustainable design and construction practices and
11 procedures, use products for patching that comply with sustainable design requirements.
12 B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use
13 materials that visually match in-place adjacent surfaces to the fullest extent possible.
14 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will
15 provide a match acceptable to Architect for the visual and functional performance of in-place
16 materials.

17 **PART 3 - EXECUTION**

18 **3.1 EXAMINATION**

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

39 **3.2 PREPARATION**

- 40 A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move,
41 or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or
42 affected by construction. Coordinate with authorities having jurisdiction.
43 B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck
44 measurements before installing each product. Where portions of the Work are indicated to fit to other
45 construction, verify dimensions of other construction by field measurements before fabrication. Coordinate
46 fabrication schedule with construction progress to avoid delaying the Work.
47 C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on
48 Drawings.
49 D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification
50 of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a
51 request for information to Architect according to requirements in Section 01 31 00 "Project Management
52 and Coordination."

- 1 **3.3 CONSTRUCTION LAYOUT**
- 2 A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in
- 3 relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect
- 4 promptly.
- 5 B. General: Engage a professional engineer licensed in the State of Wisconsin to lay out the Work using
- 6 accepted surveying practices.
- 7 1. Establish benchmarks and control points to set lines and levels at each story of construction and
- 8 elsewhere as needed to locate each element of Project.
- 9 2. Establish limits on use of Project site.
- 10 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required
- 11 dimensions.
- 12 4. Inform installers of lines and levels to which they must comply.
- 13 5. Check the location, level and plumb, of every major element as the Work progresses.
- 14 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
- 15 7. Close site surveys with an error of closure equal to or less than the standard established by
- 16 authorities having jurisdiction.
- 17 C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil
- 18 placement, utility slopes, and rim and invert elevations.
- 19 D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations,
- 20 column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey
- 21 markings and elevations for use with control lines and levels. Level foundations and piers from two or more
- 22 locations.
- 23 E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels.
- 24 Include beginning and ending dates and times of surveys, weather conditions, name and duty of each
- 25 survey party member, and types of instruments and tapes used. Make the log available for reference by
- 26 Architect.

- 27 **3.4 FIELD ENGINEERING**
- 28 A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- 29 B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points
- 30 before beginning the Work. Preserve and protect permanent benchmarks and control points during
- 31 construction operations.
- 32 C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced
- 33 to data established by survey control points. Comply with authorities having jurisdiction for type and size of
- 34 benchmark.
- 35 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- 36 D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring
- 37 field-engineering services, prepare a certified survey showing dimensions, locations, angles, and
- 38 elevations of construction and sitework.

- 39 **3.5 INSTALLATION**
- 40 A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as
- 41 indicated.
- 42 1. Make vertical work plumb and make horizontal work level.
- 43 2. Where space is limited, install components to maximize space available for maintenance and ease
- 44 of removal for replacement.
- 45 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- 46 B. Comply with manufacturer's written instructions and recommendations for installing products in
- 47 applications indicated.
- 48 C. Install products at the time and under conditions that will ensure the best possible results. Maintain
- 49 conditions required for product performance until Substantial Completion.
- 50 D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in
- 51 excess of that expected during normal conditions of occupancy.
- 52 E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on
- 53 site and placement in permanent locations.
- 54 F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive
- 55 noise levels.
- 56 G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared
- 57 and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions
- 58 are made for locating and installing products to comply with indicated requirements.
- 59

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

15 3.6 PROGRESS CLEANING

- 16 A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly.
17 Dispose of materials lawfully.
18 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
19 2. Do not hold waste materials more than seven days during normal weather or three days if the
20 temperature is expected to rise above 80 deg F.
21 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark
22 containers appropriately and dispose of legally, according to regulations.
23 a. Use containers intended for holding waste materials of type to be stored.
24 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are
25 working concurrently.
26 B. Site: Maintain Project site free of waste materials and debris.
27 C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper
28 execution of the Work.
29 1. Remove liquid spills promptly.
30 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work
31 area, as appropriate.
32 D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of
33 manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If
34 specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health
35 or property and that will not damage exposed surfaces.
36 E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
37 F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure
38 freedom from damage and deterioration at time of Substantial Completion.
39 G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers
40 or into waterways. Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and
41 Controls" and Section 01 74 19 "Construction Waste Management and Disposal."
42 H. During handling and installation, clean and protect construction in progress and adjoining materials already
43 in place. Apply protective covering where required to ensure protection from damage or deterioration at
44 Substantial Completion.
45 I. Clean and provide maintenance on completed construction as frequently as necessary through the
46 remainder of the construction period. Adjust and lubricate operable components to ensure operability
47 without damaging effects.
48 J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction,
49 completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure
50 during the construction period.

51 3.7 STARTING AND ADJUSTING

- 52 A. Coordinate startup and adjusting of equipment and operating components with requirements in
53 Section 01 91 00 "Commissioning."
54 B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units,
55 replace with new units, and retest.
56 C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
57 D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace
58 damaged and malfunctioning controls and equipment.
59 E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality
60 Requirements."

- 1 **3.8 PROTECTION OF INSTALLED CONSTRUCTION**
2 A. Provide final protection and maintain conditions that ensure installed Work is without damage or
3 deterioration at time of Substantial Completion.
4 B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by
5 construction are maintained in condition that existed at commencement of the Work.
6 C. Comply with manufacturer's written instructions for temperature and relative humidity.

7 **END OF SECTION**

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**SECTION 01 73 29
CUTTING AND PATCHING**

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16 3.4. CLEANUP AND RESTORATION 3
17

PART 1 – GENERAL

1.1. SUMMARY

- 21 A. This Section includes general procedural requirements for cutting and patching including, but not limited to the
22 following:
23 1. Examination
24 2. Preparation
25 3. Performance
26 4. Cleanup and Restoration
27

1.2. RELATED SPECIFICATION SECTIONS

- 29 A. Divisions 02 through 32 Sections for specific requirements and limitations applicable to cutting and patching
30 individual parts of the Work.
31 B. Division 07 Section "Penetration Fire Stopping" for patching fire-rated construction.
32

1.3. DEFINITIONS

- 34 A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
35 B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other
36 Work.
37

1.4. QUALITY ASSURANCE

- 39 A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying
40 capacity or load-deflection ratio.
41 B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results
42 in reducing their capacity to perform as intended or that may result in increased maintenance or decreased
43 operational life or safety.
44 C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that
45 could change their load-carrying capacity that results in reducing their capacity to perform as intended, or that
46 may result in increased maintenance or decreased operational life or safety. Some miscellaneous elements
47 include the following:
48 1. Water, moisture, or vapor barriers
49 2. Membranes and flashings
50 3. Exterior curtain-wall construction
51 4. Equipment supports
52 5. Piping, ductwork, vessels, and equipment
53 6. Noise and vibration control elements and systems
54 D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and
55 patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that
56 would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has
57 been cut and patched in a visually unsatisfactory manner.

1 **1.5. WARRANTY**

- 2 A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting
3 and patching operations, by methods and with materials so as not to void existing warranties.
4 B. All cutting and patching work performed under this contract shall be warranted like new work as defined by the
5 Specification governing the work.
6

7 **PART 2 - MATERIALS**

8
9 **2.1. GENERAL**

- 10 A. Comply with requirements specified within other sections of the Specifications.
11 B. In-Place Materials: Use materials identical to existing in-place materials. For exposed surfaces use materials that
12 visually match in-place adjacent surfaces to the fullest extent possible.
13 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the
14 visual and functional performance of in-place materials.
15

16 **PART 3 - EXECUTION**

17
18 **3.1. EXAMINATION**

- 19 A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
20 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including
21 compatibility with in-place finishes or primers.
22 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.
23

24 **3.2. PREPARATION**

- 25 A. Temporary Support: Provide temporary support of Work to be cut.
26 B. Protection: Protect in-place construction and existing conditions during cutting and patching to prevent damage.
27 Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting
28 and patching operations. If the failure to protect, or the lack of protection, of in-place construction and/or
29 existing conditions results in damage, the contractor shall be responsible for repair to previous condition.
30 C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
31 D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be
32 removed, relocated, or abandoned, bypass such services/systems before cutting to eliminate interruption to
33 occupied areas.
34

35 **3.3. PERFORMANCE**

- 36 A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the
37 earliest feasible time, and complete without delay.
38 1. Cut in-place construction to provide for installation of other components or performance of other
39 construction, and subsequently patch as required to restore surfaces to their original condition.
40 B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations,
41 including excavation, using methods least likely to damage elements retained or adjoining construction. If
42 possible, review proposed procedures with original Installer; comply with original Installer's written
43 recommendations.
44 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and
45 chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance
46 of adjacent surfaces. Temporarily cover openings when not in use.
47 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
48 3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
49 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by
50 cutting and patching operations.
51 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap,
52 valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other
53 foreign matter after cutting.
54 6. Proceed with patching after construction operations requiring cutting are complete.
55 C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following
56 performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and
57 comply with installation requirements specified in other Sections.

1 D. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of
2 installation.
3

4 **3.4. CLEANUP AND RESTORATION**

- 5 A. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a
6 manner that will eliminate evidence of patching and refinishing.
- 7 1. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - 8 2. Restore damaged pipe covering to its original condition.
 - 9 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another,
10 patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish,
11 color, texture, and appearance. Remove in-place floor and wall coverings and replace with new
12 materials, if necessary, to achieve uniform color and appearance.
 - 13 4. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch
14 and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats
15 until patch blends with adjacent surfaces.
 - 16 5. Ceilings: Patch, repair, or re-hang in-place ceilings as necessary to provide an even-plane surface of
17 uniform appearance.
 - 18 6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight
19 condition.
 - 20 7. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint,
21 mortar, oils, putty, and similar materials.
 - 22 8. Any smoke and fire caulking that has been disturbed must be replaced by the Contractor as required by
23 code.
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27 **END OF SECTION**
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**SECTION 01 74 13
PROGRESS CLEANING**

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16

PART 1 – GENERAL

1.1. SUMMARY

- 20 A. Throughout the execution of this contract all contractors shall be responsible for maintaining the project site in a
21 standard of cleanliness as described in this specification.
22 B. All contractors shall also comply with the requirements for cleaning as described in other specifications.
23 C. Work included in this specification shall include but not be limited to:
24 1. Safety Cleaning
25 2. Project Site Cleaning
26 3. Progress Cleaning
27 4. Final Cleaning
28

1.2. RELATED SPECIFICATIONS

- 30 A. Section 01 35 00 Special Procedures
31 B. Section 01 60 00 Product Requirements
32 C. Section 01 74 19 Construction Waste Management and Disposal
33 D. Section 01 76 00 Protecting Installed Construction
34

1.3. QUALITY ASSURANCE

- 36 A. The General Contractor (GC) shall conduct daily inspections, more often if necessary, of the entire project site to
37 ensure the requirements of cleanliness are being met as described within these specifications.
38 B. All contractors shall comply with other regulatory requirements as they apply to waste recycling, reuse, hauling,
39 and disposal requirements of any governmental authority having jurisdiction.
40 C. The Owner reserves the right to have work done by others in the event any contractor fails to perform cleaning
41 as described within these specifications. The cost of any Owner provided cleaning shall be charged to the
42 contractor through a deduct change order.
43

PART 2 - PRODUCTS

2.1. CLEANING MATERIALS AND EQUIPMENT

- 47 A. The Contractor shall provide all required personnel, equipment, and materials necessary to maintain the
48 required level of cleanliness as described in this specification.
49 B. Use only cleaning materials and equipment that are compatible with the surface being cleaned, as
50 recommended by the manufacturer, or as approved by the A/E.
51 C. Use only cleaning materials, equipment, and methods as recommended in the manufacturers care and use guide
52 of the material, finish or equipment being cleaned.
53

PART 3 - EXECUTION

3.1. SAFETY CLEANING

- 57 A. All Contractors shall be responsible for safety cleaning as required by OSHA and other regulatory requirements
58 as applicable.

- 1 B. Safety Cleaning shall include but not be limited to the following:
- 2 1. All work areas, passageways, ramps, and stairs shall be kept free of debris, scrap materials, pallets, and
- 3 other large items that would obstruct exiting routes. Small items such as tools, electrical cords, etc. are
- 4 picked up when not in use.
- 5 2. Form and scrap lumber shall have nails/screws removed or bent over. Lumber shall be neatly stacked in
- 6 an area designated by the GC.
- 7 3. Spills of oil, grease, and other such liquids shall be cleaned immediately or sprinkled with sand/oil-dry
- 8 first, then cleaned.
- 9 4. Oily, flammable, or hazardous items shall be stored in appropriate covered containers and storage
- 10 devices unless actively being used.
- 11 5. Oily, or flammable rags, and other such waste shall only be disposed of in authorized covered containers.
- 12 6. Disposal by burning shall not be allowed at any time.
- 13

14 3.2. PROJECT SITE CLEANING

- 15 A. This section applies to the general cleanliness of the project site as a whole for the duration of the execution of
- 16 this contract.
- 17 B. Exterior Project Site Areas
- 18 1. The GC and other Contractors as appropriate shall ensure the following levels of cleanliness are applied
- 19 to the exterior project site areas.
- 20 a. The overall appearance of the project site is neat and orderly. Defined areas for material storage,
- 21 material waste, job trailers, and the project area are clean and well maintained.
- 22 b. The construction fence is maintained, erect with no gaps, and properly posted per all regulatory
- 23 requirements.
- 24 c. All erosion control measures are properly maintained, cleaned, and repaired as necessary.
- 25 d. All loose materials (construction or waste) are properly tied or weighted down to resist blowing.
- 26 e. All construction materials are properly covered with fully functional tarps or plastic wrap,
- 27 protected from the weather, coverings are tied, strapped, or weighted down to resist blowing.
- 28 f. Dust control is applied as necessary or as required by any regulatory requirement.
- 29 C. Interior Project Site Areas
- 30 1. All Contractors shall ensure the following levels of cleanliness are applied to the interior project site
- 31 areas.
- 32 a. The overall appearance of the project site is neat and orderly. Defined areas for material storage,
- 33 material waste, and project area are clean and well maintained.
- 34 b. Stored materials are kept in original shipping containers whenever possible. Stored materials not
- 35 in shipping containers are properly stored and protected according to other applicable
- 36 specifications.
- 37 c. All scraps and debris shall be properly disposed of as often as necessary to keep work areas,
- 38 passageways, stairs, and ramps free of debris and clear for emergency exiting.
- 39 d. Boxes, pallets, and other such shipping containers, are broken down, stored in a consolidated area
- 40 or, disposed of as often as is necessary.
- 41 e. Hand tools, supplies, materials, electrical cords not being used are picked up and stored in gang
- 42 boxes, not left as walking hazards in work areas, passageways, etc.
- 43 D. Job Trailer
- 44 1. The interior of the job trailer shall be kept clean and available as a work space at all times. The GC shall
- 45 ensure that the following is provided for within the job trailer:
- 46 a. Meeting space including tables and chairs.
- 47 b. Sufficient space for all contractors to access the official construction documents, provide updates,
- 48 etc.
- 49

50 3.3. PROGRESS CLEANING

- 51 A. This sub-section shall apply to all Progress Cleaning prior to the installation of finishes, fixtures, and trim (IE
- 52 rough-in).
- 53 1. For the purposes of this section "clean" shall be defined as a level of cleanliness free of dust and other
- 54 material capable of being removed by use of reasonable effort using a good quality janitor broom and
- 55 shop-vac.
- 56 2. Daily cleanings shall be conducted by all contractors at the end of the work day as follows:
- 57 a. Debris in excavated areas shall be removed prior to backfill and compaction.
- 58 b. Debris in wall cavities, chase spaces, etc. shall be removed prior to enclosing the spaces.

- 1 c. Large items shall be properly stored, returned to designated areas, or disposed of as necessary.
2 d. Loose materials shall be properly secured.
3 e. Flammable or hazardous materials are properly stored or disposed of.
4 3. Weekly cleaning shall be conducted by all contractors as designated by the GC. Weekly cleanings shall
5 include all the above for a daily cleaning and other necessary cleaning as designated by the GC.
6 B. This sub-section shall apply to Progress Cleaning in preparation for the installation of finishes, fixtures, and trim.
7 a. Surfaces receiving finishes shall be thoroughly cleaned prior to contractors applying finish
8 materials. The GC shall be responsible for inspecting the area and surfaces being cleaned for
9 finish prior to the sub-contractor applying the finish. This shall include but not be limited to the
10 following:
11 i. Wall surfaces shall be wiped clean of dirt and oily residues, vacuumed free of dust, and
12 shall be free of surface imperfections prior to painting or installing wall coverings.
13 ii. Metal surfaces shall be wiped clean of dirt and oily residues, and be free of surface
14 imperfections prior to painting.
15 iii. Flooring shall be broom swept of large and loose items then vacuumed clean of dust and
16 small particles, damp mopped clean, and dried prior to installing any flooring finish.
17 Additional cleaning may be required depending on the preparation requirements
18 recommended by the flooring material manufacturer.
19 C. This sub-section shall apply to Progress Cleaning after the installation of finishes, fixtures, and trim.
20 1. For the purposes of this section "clean" shall be defined as a level of cleanliness free of dust and other
21 material capable of damaging or visually disfiguring finished work, finishes, fixtures, and trim.
22 2. Progress Cleaning at this point in the contract shall be conducted immediately as follows:
23 a. Dust, dirt, etc. shall be swept and vacuumed off of finish flooring and trim.
24 b. Liquid spills shall be cleaned up according to the spill type. This shall include drips and spills
25 caused by paint, stain, sealants, and other such items.
26 3. The Contractor(s) at no additional cost to the Owner shall be responsible for replacing any finished work,
27 finishes, fixtures, and trim damaged or disfigured because of inadequate or improper cleaning.
28

29 3.4. FINAL CLEANING

- 30 A. As noted in Specification 01 29 76 Progress Payment Procedures, Progress Payment Milestone Schedule, Final
31 Cleaning shall not be conducted prior to requesting the 90% contract total progress payment and all of the
32 following shall be complete:
33 1. All final regulatory inspections including but not limited to Building Inspection Department and Madison
34 Fire Department inspections have been successfully completed.
35 2. All Quality Management Observation (QMO) reports have been closed out.
36 3. All Demonstration and Training has been completed.
37 4. All Attic Stock has been consolidated and located to its designated area
38 5. All protection for installed construction shall be removed prior to final cleaning by the contractor
39 responsible for providing the protections. This shall include the removal of any adhesive residues left
40 behind from tapes. Contractors shall only use manufacturer authorized cleaning materials for removing
41 adhesives, etc.
42 B. For the purposes of this section "clean" shall be defined as a level of cleanliness generally provided by skilled
43 cleaners using commercial quality building maintenance equipment and materials.
44 C. The GC shall be responsible for ensuring that all requirements under this section are being met.
45 D. General Requirements
46 1. Employ experienced personnel or professional cleaners for final cleaning as necessary for the areas or
47 equipment being cleaned.
48 2. Cleaning equipment used shall be commercial grade equipment commonly used by professional cleaners.
49 3. Cleaning equipment and materials shall be cleaned, rinsed, or replaced to ensure a uniform level of
50 cleanliness is being maintained during the final cleaning. This shall include but not be limited to the
51 following:
52 a. Vacuum cleaner bags and/or filters are changed and/or cleaned as often as necessary.
53 b. Dust & wipe down rags are washed, rinsed, or replaced before starting each room.
54 c. Mopping equipment
55 i. Mop water for washing shall have cleaning solution added to the amount and temperature
56 per manufacturer's recommendations. Mop washing water shall be replaced often to
57 maintain the levels of the cleaning solution and temperature required.
58 ii. Mop water for rinsing shall remain clean, clear, and be replaced as often as necessary.

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- iii. Mop heads shall be rinsed often and replaced as necessary.
 - iv. Mop heads and buckets shall be thoroughly rinsed with each change of water.
 - v. Only new mop heads shall be used for rinsing.
- E. Refer to all other specifications in this contract for specific requirements regarding final cleaning of finishes, fixtures, equipment, etc.
- F. Exterior Cleaning shall include but not be limited to the following:
1. All exterior glazing surfaces have been professionally cleaned and are free of dust and streaking.
 2. Metal roofs, siding, and other surfaces shall be clean of dirt and free of splashed or excess materials such as sealants, mortar, paint, etc.
 3. All exterior furnishings shall be clean. Waste receptacles (if provided) shall be empty.
 4. Paved areas shall be clean, free of dirt, oily stains and other such blemishes
 5. Exterior lights and diffusers are clean and free of dust.
- G. Interior Cleaning shall include but not be limited to the following:
1. Remove all labels, stickers, tags, and other such items which are not required by code as permanent labels.
 2. All interior glazing surfaces, including mirrors, have been professionally cleaned and are free of dust and streaking.
 3. All interior surfaces have been cleaned of excess materials such as paint, sealants, etc. and have been wiped free of dust.
 4. Interior metals, fixtures, and trim have been cleaned free of dust and oily residues
 5. Carpet flooring has been thoroughly cleaned; vacuumed free of dust, excess glues and other stains removed per manufacturers use and care instructions.
 6. Resilient flooring has been thoroughly cleaned; vacuumed free of dust, excess glues and other stains removed, mopped and buffed per manufacturers use and care instructions.
 7. Interior non-occupied concrete floors shall be broom cleaned, vacuumed free of dust, excess glues and other stains removed per manufacturers use and care instructions.
 8. Light fixtures, lamps, diffusers and other such items have been dusted and cleaned as necessary.

3.5. CALL BACK WORK

- A. The GC shall be responsible for ensuring that any contractor returning to the project site for completion or correction work has re-cleaned and restored the area to the levels described in section 3.4 above upon completion of the work. This shall include but not be limited to the following:
1. The immediate area(s) where work was completed.
 2. Adjacent areas where dust or debris may have traveled.
 3. Other areas occupied during the completion of the call back work.
 4. Path of entrance/exit, to/from the area(s) of work.

END OF SECTION

**SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

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PART 1 – GENERAL

1.1. SUMMARY

- 24 A. This specification includes administrative and procedural requirements for the recycling, re-use, salvaging, and
25 disposal of non-hazardous construction and demolition waste.
26 B. The General Contractor (GC) shall be fully responsible for complying with all applicable ordinances and other
27 such regulatory requirements during the execution of this contract.
28

1.2. RELATED SPECIFICAITONS

- 29 A. 01 29 76 Progress Payment Procedures
30 B. 01 31 23 Project Management Web Site (SharePoint)
31 C. 01 32 19 Submittals Schedule
32 D. 01 33 23 Submittals
33 E. 01 77 00 Closeout Procedures
34 F. Other Divisions and Specifications that may address the proper disposal of construction or demolition waste as it
35 pertains to work being conducted under that particular specification.
36
37

1.3. CITY ORDINANCES

- 38 A. There are two (2) Madison General Ordinances (MGO) that the City of Madison has regarding construction and
39 demolition waste.
40 1. MGO 10.185, Recycling and Reuse of Construction and Demolition Debris, describes the requirements
41 associated with this ordinance including definitions, documentation requirements, and penalties.
42 2. MGO 28.185, Approval of Demolition (Razing, Wrecking) and Removal, describes the requirements
43 associated with applying for and receiving a demolition permit.
44 B. All City of Madison, Board of Public Works, contracts being conducted by City Engineering, Facility Management,
45 for construction, remodeling, or demolition shall comply with the above ordinances regardless of project type or
46 size.
47
48

1.4. DEFINITIONS

- 49 A. Clean: Untreated and unpainted material, free of contamination caused by oils, solvents, caulks, and other
50 chemicals.
51 B. Construction and Demolition Debris: Materials resulting from the construction, remodeling, repair, and
52 demolition of utilities, structures, buildings, and roads.
53 C. Disposal: Off-site removal of construction and demolition debris and the subsequent sale, recycling, reuse, or
54 deposit in authorized landfill or incinerator.
55 D. Hazardous: Exhibiting the characteristics of hazardous substance, i.e. ignitability, corrosiveness, toxicity, or
56 reactivity and including but not limited to asbestos containing materials, lead, mercury and PCBs.
57 E. Non-hazardous: Exhibiting none of the characteristics of a hazardous substance.
58

- 1 F. Nontoxic: Not immediately poisonous to humans or poisonous after a long period of exposure.
- 2 G. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured
- 3 into a new product.
- 4 H. Recycle: Any process by which construction or demolition debris is diverted from final disposal as solid waste at
- 5 a permitted landfill and instead is collected, separated, and/or processed into raw materials for new, reused, or
- 6 reconstituted products; or for the recovery of materials for energy production processes.
- 7 I. Recycler: Any recycling facility, transfer station, or other waste handling facility which accepts construction and
- 8 demolition debris for recycling, or for other transferring to a recycling facility.
- 9 J. Recycling: The process of sorting, cleaning, treating, or reconstituting solid waste and other discarded materials
- 10 for the purpose of preparing the material to be recyclable. Recycling does not include burning, incinerating or
- 11 thermally destroying waste.
- 12 K. Return: To give back reusable items or unused products to vendors for credit.
- 13 L. Reuse: Shall mean any of the following:
- 14 1. The on-site use of reprocessed construction and demolitions debris.
- 15 2. The off-site redistribution of a material, for use in the same manner or similar manner at another
- 16 location.
- 17 3. The use of non-toxic, clean wood as an alternative fuel source.
- 18 M. Salvage: To remove a waste material from the project site for resale or reuse by the Owner or others.
- 19 N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- 20 O. Trash: Any product or material unable to be re-used, returned, recycled, or salvaged.
- 21 P. Waste: Extra materials or products that have reached the end of its useful life or its intended use. Waste
- 22 includes salvageable, returnable, recyclable and re-useable construction and demolition materials, and trash.

23 24 **1.5. PERFORMANCE REQUIREMENTS**

- 25 A. The GC shall develop a Waste Management Plan that results in end-of-project rates for salvage/recycling/reuse
- 26 of 95 percent (minimum) by weight of the total waste generated by the Work. Percentages may be adjusted on
- 27 a project by project basis depending on selected LEED goals associated with the project.
- 28 B. The GC shall salvage or recycle 100 percent of all uncontaminated packaging materials including but not limited
- 29 to the following:
- 30 1. Paper
- 31 2. Cardboard
- 32 3. Beverage containers
- 33 4. Boxes
- 34 5. Plastic Sheet and film
- 35 6. Polystyrene packaging
- 36 7. Wood crates and pallets
- 37 8. Plastic pails and buckets
- 38 C. Promote a resourceful use of supplies and materials through proper planning and handling. Generate the least
- 39 amount of waste possible by minimizing errors, poor planning, breakage, mishandling, contamination or other
- 40 similar factors.
- 41 D. Use all reasonable means to divert construction waste from landfills and incinerators through recycling, reuse, or
- 42 salvage as appropriate.

43 44 **1.6. SUBMITTALS AND DELIVERABLES**

- 45 A. The GC shall provide his/her completed Waste Management Plan to the Project Management Web Site
- 46 (SharePoint) as a submittal for review by the Project Architect and City Project Manager.
- 47 1. See item 1.8 below for Waste Management Plan submittal requirements.
- 48 2. The Waste Management Plan shall be completed, submitted, and approved as a pre-requisite for
- 49 Progress Payment number 1.
- 50 3. Copies of all documentation required by this specification shall be submitted to the appropriate Project
- 51 Management Web Site (SharePoint) Library. Documentation shall be reviewed by the City Project
- 52 Manager during all Progress Payment reviews for compliance and accuracy.
- 53 B. The Waste Management Coordinator shall provide copies of items 1 through 5 below to the appropriate Project
- 54 Management Web Site (SharePoint) Library and shall update the Waste Management Summary Log to reflect the
- 55 records being submitted.
- 56 1. Records of Donations: Indicate receipt and acceptance of itemized salvageable waste donated to
- 57 individuals or organizations. Indicate if the organization is tax exempt.

- 1 2. Records of Sales: Indicate receipt and acceptance of itemized salvageable waste sold to individuals or
- 2 organizations. Indicate if the organization is tax exempt.
- 3 3. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by
- 4 recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts and
- 5 invoices.
- 6 4. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and
- 7 incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts and invoices.
- 8 5. Statement of Refrigerant Recovery: The Refrigerant Recovery Technician responsible for recovering
- 9 refrigerant shall provide the GC with a statement indicating all of the following:
- 10 a. All recovery was performed according to EPA Regulations.
- 11 b. All refrigerant present was recovered; indicate the total quantity recovered by unit.
- 12 c. Date of Recovery.
- 13 d. Name, address, company name, and phone number of technician performing the recovery.
- 14 e. Technician shall sign and date the statement.
- 15 C. LEED Submittal: The GC shall provide the following information using the appropriate LEED letter template upon
- 16 project completion: indicating that the requirements of the credit have been met. *NOTE: This requirement shall*
- 17 *only apply to projects having a LEED certification goal.*
- 18 1. Total waste material generated.
- 19 2. Total waste material diverted by diversion method; recycling, salvage, re-use, etc.
- 20 3. Statement that the credit requirements have been met.
- 21 4. GC shall sign the letter.
- 22

23 **1.7. QUALITY ASSURANCE**

- 24 A. Waste Management Coordinator: The GC shall be responsible for designating a Waste Management
- 25 Coordinator. Coordinator may be the GC Supervisor, GC Project Manager or other member of the GC staff
- 26 having knowledge of proper waste management procedures and all applicable regulations.
- 27 B. Regulatory Requirements: comply with all hauling and disposal regulations of authorities having jurisdiction.
- 28 C. The Waste Management Coordinator shall comply with Specification 01 31 19 Project Meetings, Section 3.7.B.1
- 29 and conduct a Waste Management Conference at the job site. This conference shall be repeated as necessary as
- 30 additional trades are added to the Work. The conference shall include but not be limited to the following:
- 31 1. Identify the Waste Management Coordinator; provide trade contractors with name, phone, and email
- 32 information.
- 33 2. Review and discuss the Waste Management Plan and the roles of the Coordinator.
- 34 3. Review the requirements for documenting and reporting procedures of each type of waste and its
- 35 disposition.
- 36 4. Review procedures for material separation; indicate availability and locations of containers and bins.
- 37 5. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
- 38 6. Review waste management procedures specific to each trade.
- 39 D. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- 40

41 **1.8. WASTE MANAGEMENT PLAN**

- 42 A. Develop a plan consisting of waste identification, a waste reduction work plan, and cost/revenue analysis.
- 43 Indicate quantities by weight or volume. Use the same units of measure throughout the waste management
- 44 plan.
- 45 1. Waste Identification: Indicate anticipated types and quantities of site clearing, demolition waste, and
- 46 construction waste that will be generated during the execution of this contract. Include assumptions for
- 47 the estimates.
- 48 2. Waste Reduction Work Plan: The work plan shall consist of but not be limited to all of the following:
- 49 a. Identify methods for reducing construction waste. Re-using, framing and forming materials, re-
- 50 planning material cuts to minimize waste, etc.
- 51 b. Identify what types of materials will be recycled. Provide lists of local companies that receive
- 52 and/or process the materials. Include names, addresses, and phone numbers.
- 53 c. Identify what types of materials will be disposed of and whether it will be disposed of in a landfill
- 54 facility or by incineration facility. Provide lists of local companies that receive and/or process the
- 55 materials. Include names, addresses, and phone numbers.
- 56 d. Identify methods to be used on site for separating waste including all of the following:
- 57 i. Sizes of containers to be used.
- 58 ii. Labels to be used on the containers to identify the type of waste allowed in the container.

- 1 iii. Designated locations on the project site for waste material containers.
- 2 B. If project requires demolition incorporate the ordinance required (MGO 28.185) Recycling and Reuse Plan into
- 3 the Waste Management Plan.
- 4 C. Provide all of the following for the Waste Management Coordinator:
- 5 1. Name, employer, employer address, phone number, and email address of the designated coordinator.
- 6 a. The GC shall also provide this information with the required Project Directory Submittal at the
- 7 beginning of the project.
- 8 D. If at the option of the GC, he/she chooses to contract with a Waste Management Disposal Company that allows
- 9 comingled and unsorted waste materials, the GC shall include with his/her Waste Management Plan the
- 10 following:
- 11 1. Name, address, phone number, state permitting information, and other pertinent information about the
- 12 disposal company.
- 13 2. Documentation from the disposal company indicating company policies and procedures regarding
- 14 comingled and unsorted waste materials to include:
- 15 a. GC responsibilities on the project site.
- 16 b. Disposal company procedures for receiving, sorting, recycling, and disposing of comingled and
- 17 unsorted waste material.
- 18

19 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

20

21 **PART 3 - EXECUTION**

22

23 **3.1. PLAN IMPLEMENTATION**

- 24 A. Implement the approved waste management plan. Provide adequate containers, storage space, signage,
- 25 transportation and other items required to implement the plan during the execution of this contract.
- 26 B. The GC and Waste Management Coordinator shall be responsible for monitoring and reporting the status of the
- 27 Waste Management Plan and shall monitor the waste management practices on site as frequently as needed.
- 28 C. Train all workers, sub-contractors, and suppliers on proper waste management procedures as appropriate for
- 29 the work being conducted on the project site.
- 30 1. Distribute the waste management plan to everyone concerned within seven (7) days of submittal
- 31 approval.
- 32 2. Distribute the waste management plan to new workers, sub-contractors, and suppliers when they first
- 33 appear on the project site.
- 34 3. Conduct additional training as needed during the execution of the contract to keep a positive focus on
- 35 the waste management plan.
- 36 D. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways,
- 37 and other adjacent and used facilities.
- 38 1. Designate and label specific areas on the project site necessary for separating materials to be salvaged,
- 39 recycled, reused, donated, and sold.
- 40 2. Comply with any specification or regulatory requirements pertaining to dust, dirt, environmental
- 41 protection, and noise control.
- 42

43 **3.2. HAZARDOUS AND TOXIC WASTE**

- 44 A. The Owner shall be responsible under separate contract for the removal of any asbestos related materials. All
- 45 other materials shall be removed by the GC.
- 46 B. All hazardous and toxic waste shall be separated, stored, and disposed of according to all applicable regulations.
- 47 C. All hazardous and toxic materials on site shall have a Material Safety and Data Sheet (MSDS) available that
- 48 indicates storage requirements, emergency information, and disposal requirements as necessary.
- 49

50 **3.3. GENERAL GUIDELINES FOR ALL WASTES**

- 51 A. Recycle all paper and beverage containers used by workers, sub-contractors, suppliers and visitors to the project
- 52 site.
- 53 B. All revenues, savings, rebates, tax credits, and other such incentives received from recycling, reusing, or
- 54 salvaging waste materials shall accrue to the GC unless specified otherwise in the contract documents.
- 55 C. Separate recyclable, reusable, and salvageable waste from other waste materials, trash, and debris except where
- 56 Waste Management Disposal Company allows comingled waste materials, see section 1.8.D above.
- 57 1. Separate by type in appropriate containers or designated areas according to the approved waste
- 58 management plan away from the construction area. Do not store within the drip lines of existing trees.

- 1 2. Inspect containers and bins frequently for contamination and inappropriately sorted materials. Remove
- 2 contaminated materials and resort as necessary.
- 3 3. Stockpile bulk materials such as sand, topsoil, stone, etc., on site away from the construction area and
- 4 without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water, and
- 5 cover to prevent windblown dust. Do not store within the drip lines of existing trees.
- 6 4. Whenever possible store items off the ground and/or protect them from the weather.
- 7

8 **3.4. GUIDELINES FOR RECYCLABLE, RE-USABLE, AND SALVAGEABLE WASTE**

- 9 A. The following guidelines is not a complete or all inclusive list and shall be adjusted as needed by the methods
- 10 and procedures identified in the Waste Management Plan.
- 11 B. Asphalt Paving: Break-up into transportable pieces or grind, transport to an authorized recycling facility.
- 12 C. Carpet and Pad: Separate carpet and pad scraps, containerize and transport to an authorized recycling facility.
- 13 D. Ceiling System Components: Suspended ceiling system components shall be sorted by material type as follows:
- 14 1. Broken, cut, or damaged tiles shall be containerized, transport to an authorized recycling facility.
- 15 2. Damaged, or cut tracks, trim and other metal grid system components shall be sorted with other metals
- 16 of similar types, palletize, transport to an authorized recycling facility.
- 17 E. Clean Fill: When allowed by Division 31 Specifications; concrete, masonry, stone, asphalt pavement, sand and
- 18 other such materials may be used as clean fill on this project site. The GC shall verify with the Project Architect,
- 19 Structural Engineer, or Civil Engineer as necessary prior to using any materials as clean fill. Materials shall be
- 20 processed, placed, and compacted as specified. If not being re-used on site, transport to an authorized recycling
- 21 facility.
- 22 F. Clean Wood Materials: Including but not limited framing cutoffs, wood sheathing or paneling materials,
- 23 structural or engineered wood products, and pallets or crates. Clean Wood shall be free of paints, stains, oils,
- 24 preservatives and other such contaminants.
- 25 1. Useable pieces shall be sorted by type and dimension, bundled and transported off site by the GC or
- 26 returned to the supplier.
- 27 2. Non-useable pieces shall be palletized or containerized, transport to an authorized recycling facility.
- 28 3. Clean, uncontaminated sawdust and wood shavings shall be bagged, transport to an authorized recycling
- 29 facility.
- 30 G. Concrete: Break-up into transportable pieces, remove all reinforcing and other metals, transport to an
- 31 authorized recycling facility.
- 32 H. Glass Products: Shall be sorted by types, do not include light fixture lamps and bulbs. Products broken in
- 33 shipment shall be returned to the supplier. Broken or cracked items still in frames shall be taped to prevent
- 34 further breakage and injury to workers. Transport to an authorized recycling facility.
- 35 I. Gypsum Board: Stack large clean pieces on wooden pallets or container, store in a dry location, transport to an
- 36 authorized recycling facility.
- 37 J. Light Fixture Lamps and Bulbs: Fluorescent tubes shall be containerized, transport to an authorized recycling
- 38 facility.
- 39 K. Masonry and CMU: Remove all metal reinforcing, anchors, and ties, clean undamaged pieces and neatly stack on
- 40 pallets, transport damaged pieces to an authorized recycling facility.
- 41 L. Metals: Sort metals by type as follows, this does not include piping:
- 42 1. Architectural metals including but not limited to siding, soffit, and roofing panels shall be sorted by
- 43 material, palletize or bundle as needed and transport to an authorized recycling facility.
- 44 2. Structural steel, sort by size and type; palletize and transport to an authorized recycling facility.
- 45 3. Miscellaneous metals such as aluminum, brass, bronze, etc shall be sorted by type, containerized or
- 46 palletized as necessary, transport to an authorized recycling facility.
- 47 M. Packaging and shipping materials
- 48 1. Cardboard boxes and containers: Breakdown all cardboard boxes and containers into flat sheets. Bundle
- 49 and store in a dry location until transported for recycling.
- 50 2. Pallets:
- 51 a. Whenever possible require deliveries using pallets to remove them from the project site.
- 52 b. Neatly stack pallets in preparation for reusing them or providing them to other companies for
- 53 salvage or re-use.
- 54 c. Break down pallets into component wood pieces that comply with the requirements for recycling
- 55 clean wood materials. Neatly stack or palletize pieces in preparation for transportation.
- 56 3. Crates: Break down crates into component wood pieces that comply with the requirements for recycling
- 57 clean wood materials. Neatly stack or palletize pieces in preparation for transportation.
- 58 4. Polystyrene Packaging: Separate and bag materials.

- 1 N. Piping and conduit: Reduce all piping and conduit to straight lengths, sort and store by size, material and type.
- 2 Remove supports, hangers, valves, boxes, sprinkler heads, and other such components, sort and store by size,
- 3 material and type. Transport to authorized recycling facilities according to material types.
- 4 O. Roofing: Roofing materials shall be sorted and containerized by type, transport to authorized recycling facilities
- 5 according to material types.
- 6 P. Site-Clearing Waste: Sort all site waste by type.
- 7 1. Only stockpile soils types and quantities required for re-use on the project site. All remaining quantities
- 8 shall be transported off site to an authorized facility that receives such materials.
- 9 2. Brush, branches, and trees with no marketable re-use shall be transported to facilities for chipping into
- 10 mulch.
- 11 3. Trees with a marketable re-use shall be salvaged and transported to facilities that specialize in processing
- 12 trees for future use as wood products.
- 13

14 **3.5. GUIDELINES FOR DISPOSAL OF WASTES**

- 15 A. The following guidelines shall be adjusted as needed by the methods and procedures identified in the Waste
- 16 Management Plan.
- 17 B. Any waste that is contaminated, organic, or cannot be recycled, re-used, or salvaged shall be legally disposed of
- 18 in an authorized landfill or incinerator. Disposal methods shall follow all applicable regulatory requirements.
- 19 C. No waste material of any kind, except those types designated as clean fill in section 3.4 above, shall be allowed
- 20 to be buried on the project site at any time.
- 21 D. No burning of any kind of waste material shall be permitted on this project site at any time.
- 22 E. Paint and Stain: Paints, stains, and their containers shall be disposed of as follows:
- 23 1. Whenever possible containers should be thoroughly cleaned immediately after emptying and sorted with
- 24 as appropriate (metal or plastic) for recycling
- 25 2. Empty containers, regardless of type or base material, may be disposed of with lids off with general
- 26 garbage.
- 27 3. Latex paint may be placed with general garbage if properly solidified as follows:
- 28 a. Small amounts (an inch or less in can): Remove lids and allow paint to dry out in the can and
- 29 harden. Protect cans from rain and freezing.
- 30 b. Large amounts (more than one inch): Mix paint with equal amounts of cat litter, stir and allow to
- 31 completely dry. Alternate method: mix with commercial paint hardener.
- 32 4. Oil-based or combustible paints and stains, regardless of liquid or solid, shall be transported to an
- 33 approved facility that takes such items such as Dane County Clean Sweep Sites.
- 34 F. Treated Wood Materials: Treated wood materials including but not limited to wood that has been painted,
- 35 stained, or chemically treated shall not be recycled or incinerated.
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END OF SECTION

SECTION 01 76 00
PROTECTING INSTALLED CONSTRUCTION

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PART 1 – GENERAL

1.1. SUMMARY

- 25 A. The purpose of this specification is to provide clear responsibilities, guide lines, and requirements related to
26 providing protection to already installed construction.
27 B. Already installed construction shall include but not be limited to the following:
28 1. Any existing site feature such as pavement, curbs, drainage features, utilities, landscaping features (trees,
29 shrubbery, plantings, flagpoles, etc.) and other such exterior items not associated with the building
30 whether on or adjacent to the project site.
31 2. Any existing structure on or adjacent to the project site.
32 3. Any existing interior work that may be adjacent to the new work including all paths of ingress/egress to
33 areas associated with accessing the Work.
34 4. Any existing feature of any kind within the public right-of-way that may be on the project site property,
35 adjacent to the project site or across the street from the project site.
36 C. All contractors shall be familiar with the specifications of their Division of Work for specific requirements on
37 protection of the Work.
38 D. The requirements noted within this specification do not relieve any contractor of the responsibility for
39 compliance with any code, statute, ordinance, or other such regulatory requirement having jurisdictional
40 authority over these contract documents.

1.2. QUALITY ASSURANCE

- 43 A. It shall be the responsibility of every contractor and worker assigned to the project to be diligent in protecting all
44 existing work, and newly installed construction.
45 B. It shall be the General Contractors' (GC) responsibility under the contract to provide all reasonable protection
46 methods, materials, or precautionary measures required to protect new or existing construction as described in
47 within this specification to the project as a whole.
48 1. The GC shall be responsible to ensure any damaged new or existing construction is repaired or replaced
49 at no additional cost to the Contract.
50 2. The GC at his/her discretion may direct other contractors to provide and maintain protection of
51 completed work associated with their Division of Work. I.E.: The carpet installer may be required by the
52 GC to provide carpet protection along traveled paths, ingress/egress, etc. after installation.
53 C. It shall be the responsibility of the GC to ensure that all materials being used to protect installed construction are
54 compatible with, and/or adjacent to, the materials being protected. This shall include but not be limited to the
55 material used as covering, tapes used to fasten protective materials, etc.

1
2 **1.3. RELATED SPECIFICATIONS**

- 3 A. Parts of this specification will reference articles within “The City of Madison Standard Specifications for Public
4 Works Construction”.
- 5 1. Use the following link to access the Standard Specifications web page:
6 <http://www.cityofmadison.com/business/pw/specs.cfm>
7 a. Click on the “Part” chapter identified in the specification text. For example if the specification
8 says “Refer to City of Madison Standard Specification 210.2” click the link for Part II, the Part II
9 PDF will open.
10 b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you
11 to the referenced text.
12 c. City Standard Detail Drawings (SDD) may be located from the index in Part VIII.
- 13 B. Section 01 60 00 Product Requirements
14 C. Section 01 74 13 Progress Cleaning
15

16 **PART 2 - PRODUCTS**

17
18 **2.1. FENCING MATERIALS AND BARRICADES**

- 19 A. Except where noted in other areas of the construction documents, the responsible contractor shall provide a six
20 foot galvanized chain link fence including full height mesh screen at the project lines as shown on the Civil
21 Drawings. For temporary barricade situations, the responsible contractor may provide one of the following that
22 sufficiently provide a sturdy physical barrier and/or visual barrier as necessary for the intended application.
- 23 1. Standard orange construction barrels each with a standard rubber base ring and reflective tape
24 a. Provide flashing amber lights as needed to increase night time visibility
25 2. Steel “T” style fence posts
26 3. 4’0” high standard orange construction fence
27 4. Traffic barricades
28 5. Jersey barriers
29 6. Other types of fencing or barricades typically used in the construction industry
- 30 B. The contractor responsible for providing the fencing materials and barricades shall also be responsible for
31 maintaining them. This shall include but not limited to fixing damaged fencing, standing up barrels that have
32 been knocked over, realigning barrels, and ensuring flashing lights are fully operational at all times.
- 33 C. The following fencing and barricade designations, and their use descriptions shall be used throughout this
34 specification to provide uniformity in describing protection requirements.
- 35 1. Type A, Jersey Barriers, to be used as permanent blocking devices to deny access to alternate project site
36 entrances or exits.
37 2. Type B, Traffic Barricades, to be used as temporary blocking devices to deny access to alternate project
38 site entrances or exits.
39 3. Type C, Construction Barrels without construction fencing shall be used for lane closures, temporary
40 blocking devices to deny access and the protection of single locations (I.E. identify the location of an
41 access structure) that do not require fencing.
42 4. Type D, Construction Barrels with construction fencing where it becomes necessary to surround an object
43 with a complete visual barricade and it is impractical or unacceptable to install fence posts. The surround
44 shall be constructed in such a manner as to provide a buffer zone around and access to the item being
45 protected.
46 5. Type E, Steel “T” Fence Posts shall be used at the project lines, as indicated on the Civil Drawings, with six
47 foot galvanized chain link fencing to surround an object with a complete visual barricade and it is
48 practical to install fence posts. The surround shall be constructed in such a manner as to provide a buffer
49 zone around and access to the item being protected. All posts shall be driven installed. Surface mounted
50 posts to only be used for temporary barricades.
51 6. Type X, Other fencing or barricade types that may be designated and detailed within the construction
52 documents shall use additional alpha numeric designations.
53

54 **2.2. EROSION CONTROL PROTECTION**

- 55 A. Refer to City of Madison Standard Specification 210.2 for authorized materials associated with erosion control
56 materials.
57

1 **2.3. INTERIOR FINISH PROTECTION MATERIALS**

- 2 A. Except where noted in other areas of the construction documents or this specification the responsible
3 contractor:
4 1. Shall not provide the cheapest or least effective method as an effort to meet any protection requirement.
5 2. Shall provide materials of sufficient quality, and durability to provide adequate protection based on the
6 seasonal conditions and the anticipated duration at the time the protection will be needed.
7 3. Shall provide sufficient quantity of protection material to protect the construction as needed.
8 B. Prior to installing protective measures the responsible contractor shall propose to the GC, Project Architect (PA)
9 and City Project Manager (CPM) the proposed plan for protection, materials to be used and samples as
10 necessary.
11 1. The PA and CPM reserve the right to disapprove any proposed method and/or material and/or make
12 alternate proposals.
13

14 **PART 3 - EXECUTION**

15
16 **3.1. GENERAL EXECUTION REQUIREMENTS**

- 17 A. The GC shall be responsible for ensuring all of the following procedures and requirements are implemented as
18 needed for the duration of the Work performed under this contract.
19 B. The GC shall also be responsible for the following:
20 1. Reporting any incident of damage to existing property, right-of-way, or utility to the CPM immediately
21 upon rendering the incident safe, and notifying emergency response teams, and emergency utility crews
22 as needed.
23 2. Conduct a site walk through prior to leaving at the end of each day to assess:
24 a. Protection measures are properly in place, provide correction actions as necessary.
25 b. Note damage to existing completed work and schedule repair/replacement as needed.
26 3. Ensure all contractors and workers are being diligent in protecting existing work, and newly installed
27 construction.
28

29 **3.2. PROTECT ADJACENT PROPERTIES**

- 30 A. Whenever possible through the design process the City of Madison shall have previously provided notice to
31 adjacent property owners that work will be occurring on or near their property. The City of Madison shall also
32 have obtained any permanent or temporary easements that may be necessary to complete any Work on
33 adjacent properties.
34 B. It shall be the responsibility of the GC to do the following for all Work under this contract being performed on or
35 adjacent to the property line:
36 1. Contact the adjacent property owner and provide him/her with information on the work to be done,
37 equipment to be used, and estimated duration of the work. Information to be updated and
38 communicated to property owner(s) as construction progresses and site conditions change.
39 a. If any adjacent property is a rented or leased space the GC shall also make contact and provide
40 the same information to the tenants.
41 b. Determine from the owner and/or tenants if there are any concerns for children, pets, special
42 plantings, or other concerns.
43 2. Discuss the following with all contractors performing work on or near the property line.
44 a. Work to be completed and timeline.
45 b. Concerns of adjacent property owners/tenants from item 1 above.
46 c. Which protective measures will be necessary to protect adjacent properties and address the
47 concerns of adjacent property owners/tenants.
48 3. Ensure all protective measures are placed and maintained during the execution of Work on or adjacent to
49 the property line. Interact with the adjacent property owners/tenants as needed.
50 C. Any contractor doing work on or adjacent to the property line shall install and maintain any protective measure
51 identified in the contract documents, this specification, or as directed by the GC.
52 D. The GC shall be responsible for restoring any damage to structure and property located on or adjacent to the
53 property line.
54 1. Restoration shall include but not be limited to repair or replacement using like materials and finishes to
55 its original condition or better.
56 2. Restoration of landscaping materials shall include watering of any seed, sod, or other planting of any kind
57 for a reasonable period of time to encourage germination and root development.
58 E. The GC shall keep the CPM informed directly to any issues pertaining to adjacent property owners and tenants.

1
2 **3.3. PROTECT LANDSCAPING FEATURES**

- 3 A. Except where specifically stated in other areas of the construction documents the following minimal protection
4 requirements shall apply under this section.
- 5 1. Whenever possible do not install new landscape features until exterior building construction has been
6 completed, equipment such as scaffolding and lifts are no longer needed and have been removed, and
7 heavy equipment operation is no longer required.
- 8 2. Whenever possible remove and temporarily store all existing landscape features such as benches, waste
9 receptacles, signage, and other such features that will be within the area of Work that can be removed.
- 10 a. Owner will remove all portable items before construction begins.
- 11 b. If Contractor encounters any missed items they shall carefully remove, brush clean of excess dirt,
12 box by like item, and deliver to owner.
- 13 3. Landscape features that cannot be removed such as flag poles, light poles, light bollards, etc. shall be
14 protected with Type D fencing for areas on pavement or Type E fencing for areas on soil.
- 15 a. Contractor shall verify with Olbrich Maintenance staff before installing any fencing that requires
16 stakes to ensure all private utilities have been marked. See section 3.4 below for additional
17 details.
- 18 4. Planting beds shall be protected using Type E fencing around the exposed perimeter of the planting bed
19 as needed.
- 20 a. Where construction limits fencing divides existing planting beds the construction limits fence shall
21 take precedence.
- 22 b. Contractor shall work with Olbrich Gardens Horticulture Director and Olbrich Maintenance staff
23 when locating construction fence through existing planting beds.
- 24 5. The City of Madison Standard Specification 107.13 shall apply to all tree protection in and around the
25 project site at all times.
- 26 a. For the purposes of this contract the Olbrich Gardens Horticulture Director shall replace all
27 references to the City Forester and forestry staff.
- 28 b. For the purposes of this contract NO CONTRACTOR shall be authorized to cut or prune any tree,
29 shrub, branch, limb, or root.
- 30 i. This shall apply to all trees and shrubs on or adjacent to the Olbrich Gardens property
31 including but not limited to both sides of the Sugar Ave. construction access from Atwood
32 Ave. to the construction entrance, all areas within the construction limits and all areas
33 adjacent to the construction limits being affected by Work within this contract.
- 34 ii. Contractors shall be required to coordinate all cuttings with the Olbrich Gardens
35 Horticulture Director or designated staff representative.
- 36 iii. All cuttings shall be performed by Olbrich Gardens Horticulture staff members only.
- 37 • Whenever possible Olbrich staff would prefer to prune trees and shrubs in a manner
38 and at a time that is appropriate for the species so as not to compromise the long term
39 health of the tree/shrub being pruned.
- 40 • Olbrich staff WILL NOT cut or prune the monumental Swamp White Oak (see item 6
41 below) during the growing season. Typically, this is April 1 through October 1 but may
42 be dependent on the weather. This shall be at the sole discretion of the Olbrich
43 Gardens Horticulture Director.
- 44 c. Contractor shall work with care within excavations when exposing any tree roots. Carefully
45 excavate around roots. Consult with Olbrich Gardens Horticulture Director if any roots become
46 damaged. DO NOT bury damaged roots that have not been properly cared for.
- 47 i. Exposed roots shall be wrapped and maintained by the Contractor. This shall include
48 watering as required by the Olbrich Gardens Horticulture Director.
- 49 6. The Contractor shall fully protect the trunk, limbs, branches and roots of the monumental Swamp White
50 Oak (*Quercus bicolor*) tree in the courtyard that is to remain.
- 51 a. The Contractor shall allow the Olbrich Gardens Horticulture Director access to the tree and root
52 system at all times during the execution of this contract.
- 53 i. The Contractor shall provide a minimum of 3 working day notice before commencing any
54 backfilling, installation of sub-base, or other related work involving burying exposed root
55 systems.
- 56 ii. Contractor shall follow prescribed compaction methods of any soil type over the root
57 system that may be identified within the drawings and specifications of this contract.

- 1 b. Any damage to this tree including but not limited to damage to the trunk, major limbs, and root
2 system caused by Work or equipment under this contract shall result in an immediate assessment
3 by a State of Wisconsin Certified Arborist chosen by the Olbrich Gardens Horticulture Director.
4 c. City Standard Specifications Section 107.13(i) COST RECOVERY CHARGES AND LIQUIDATED
5 DAMAGES shall apply to any damage caused by work or equipment in this contract as follows:
6 i. The Contractor shall be responsible for all fees incurred for assessment by a state certified
7 arborist.
8 ii. The Contractor shall be responsible for any fees incurred where damage is repairable and
9 performed by, or as directed by a state certified arborist.
10 iii. If the damage is determined to be irreparable, compromises the long term health, or
11 structural integrity of the tree the tree shall be replaced with a 6" caliper Swamp White
12 Oak (*Quercus bicolor*) to be selected by the Olbrich Gardens Horticulture Director. The
13 Contractor shall be responsible for all costs and fees associated with replacing the tree to
14 include but not be limited to the following:
15 • Complete removal of the existing tree including the stump and root system and any
16 additional work or materials to the contract caused by the removal.
17 • Cost of the replacement tree described above.
18 • All costs associated with shipping of the replacement tree.
19 • All costs associated with the installation of the replacement tree.
20 iv. No contract extension will be considered for any delays caused by the tree replacement.
21

22 **3.4. PROTECT UTILITIES**

- 23 A. The contractor shall be responsible for notifying all utilities to determine emergency response procedures and
24 protection requirements prior to installing any construction protection.
25 1. This includes requesting utility marking through Diggers Hotline.
26 a. Call 811 or 1-800-242-8511 to request a public utility locate
27 b. For emergency locate call (262) 432-7910 or (877) 500-9592
28 2. The Owner has a significant amount of buried electrical lines and irrigation piping that supports the
29 gardens.
30 a. The Contractor shall coordinate with Olbrich Maintenance Staff prior to digging to ensure all
31 known private utility work has been identified.
32 b. If any unmarked private water, irrigation or electrical service is hit during excavation the
33 Contractor shall immediately notify Olbrich Maintenance Staff to shut down the affected service.
34 i. The Contractor shall be responsible for making any permanent repairs necessary to these
35 services.
36 ii. Repair method shall be as specified by Olbrich Maintenance Staff at the time of the repair.
37 B. Except where specifically stated in other areas of the construction documents the following minimal protection
38 requirements shall apply under this section.
39 1. Hydrants, lamp posts, electrical transformers, and other utility pedestals shall be protected with Type D
40 fencing for areas on pavement or Type E fencing for areas on soil. Fence posts shall be located so as to
41 not be directly over the utility main.
42 2. Storm sewer structures in pavement shall have proper inlet protection according to City of Madison
43 Standard Specification 210.1(g) and Type C Construction Barrels when necessary.
44 3. Storm sewer structures in turf and other landscaped areas shall have proper inlet protection according to
45 City of Madison Standard Specification 210.1(g) and Type E fencing for areas on soil.
46 4. Stormwater Management features such as greenways, retention/detention ponds, bio-filtration ponds
47 and other such features shall be properly protected according to the appropriate erosion control
48 measure specified on the Erosion Control Plan. See multiple sections of City of Madison Standard
49 Specification 210.1
50 a. For the protection of hard to see items such as structures, castings, inlets, etc. in grassy areas
51 provide Type E fencing for areas on soil.
52 c. For the protection of storm water management features having special soils and plants such as
53 bio-filtration ponds provide Type E fencing for areas on soil.
54 5. Other structures and covers including but not limited to cleanouts, wiring hand holes, valve boxes, access
55 structures, grease trap structures, etc. shall be protected as follows:
56 a. Provide Type E fencing for areas on soil.
57 b. When paving operations are complete provide a construction barrel or cone near structures as
58 necessary depending on required heavy construction traffic.

- 1 6. Temporary Fiber, see also Specification 01 50 00 Temporary Facilities and Controls, Section 1.5.C.
2 a. If the GC elects to provide a temporary aerial run of the fiber optic line the line shall be supported
3 as needed to prevent sagging and stretching at a height that exceeds all construction, Owner, and
4 Owners Vendors vehicle/equipment heights.
5 i. Poles, bracing, guy wires and other related equipment shall not impede said vehicles or
6 pedestrian traffic.
7 b. If the GC elects to provide a temporary surface run of the fiber optic line the line shall be
8 protected in a solid pipe capable of withstanding all construction, Owner, and Owners Vendors
9 vehicle/equipment weights.
10 i. On pavement pipe shall be adequately protected by asphalt or compacted fill that provides
11 an adequate ramp for vehicles to pass over the pipe and without making the ramp a
12 tripping hazard for pedestrians.
13 c. GC shall check condition of the temporary installation daily and take actions as needed to protect
14 the temporary fiber optic line.
15

16 **3.5. PROTECT PUBLIC RIGHT OF WAY**

- 17 A. Except where specifically stated in other areas of the construction documents the following minimal protection
18 requirements shall apply under this section.
19 1. All public right-of-way (area from behind the sidewalk to the centerline of the street) shall remain open
20 and accessible except during periods of active work. At such times the public right of way shall be
21 properly closed and signed as referenced in City of Madison Standard Specification 107.9.
22 2. Bus stops and bus stop structures shall remain accessible at all times.
23 3. Traffic signage and traffic signals, traffic control boxes shall be protected with Type D fencing for areas on
24 pavement or Type E fencing for areas on soil.
25 a. Protection at traffic signage/signals shall not obstruct the viewing of the sign/signal for its
26 intended purpose at any time.
27 B. When additional protection for traffic control is required, the use of barricades, guardrails, lane closures and
28 other such procedures will be detailed within the construction documents.
29 C. When additional protection for overhead sidewalk cover is required the contract documents shall indicate the
30 specific location and structural requirements of the protective structure.
31

32 **3.6. PROTECT STORED MATERIALS**

- 33 A. All contractors shall refer to Specification 01 60 00 Product Requirements for all storage and protection
34 requirements of building materials and products delivered to the site.
35

36 **3.7. PROTECT WORK - EXTERIOR**

- 37 A. Provide all temporary services that may be required to protect the installed material from heat, cold, humidity,
38 etc., while materials such as concrete, mortar, sealants, paints, etc., are drying and/or curing.
39 B. Open trenches, pits, and other such excavations shall be properly covered, lined, or shored as needed during
40 periods of inclement weather to prevent the caving of soils onto existing work in progress. Refer to the
41 appropriate specifications and/or regulatory requirements governing this type of work as necessary.
42 C. Provide adequate protection at all openings with heavy duty tarps, plastic sheathing, or wood framing and
43 sheathing as needed to protect interior work in progress from inclement weather as needed.
44 D. Protect exterior finishes of all kinds with heavy duty tarps or plastic sheathing as needed while landscaping is
45 being installed through full germination of seeded areas or installation of filter fabric and mulches to keep dust,
46 dirt, and mud off of finished exterior surfaces.
47 E. Designate specific curb mounting points and provide wood blocking where small vehicles, skid loaders and other
48 such equipment may need access to areas being landscaped.
49 F. Provide plywood turning pads for skid loaders to turn on to prevent tire marking on new pavement.
50 G. Do not permit the parking of vehicles with any kind of fluid leaks to park on new pavement.
51 H. The contractor shall be responsible for cleaning, repairing, or replacing any completed work or work in progress
52 under this specification as deemed necessary by the CPM without additional cost to the contract.
53

54 **3.8. PROTECT WORK - INTERIOR**

- 55 A. The GC shall do all of the following:
56 1. Provide all temporary services that may be required to protect the installed material from heat, cold,
57 humidity, etc., while materials such as concrete, mortar, sealants, paints, etc., are drying and/or curing.

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2. Provide adequate visual and/or physical protection as needed to protect newly completed interior work such as paint, flooring material, sealants, grouts, etc. that may be drying and/or curing.
 3. Provide adequate space and materials for cleaning boots, tool boxes, supplies, and other items coming into the project site once finish work has begun.
 4. Clean dirtied areas and repair/replace damaged areas immediately.
- B. The contractors responsible for interior work shall be responsible for protecting their work and finishes from dirt, mud, snow, spills, splatters, and physical damage after installation as follows:
1. Protect vinyl composite, rubber composite, painted/stained concrete, and tiled flooring as follows:
 - a. Define foot traffic areas and protect with Ramboard Temporary Floor Protection products as a minimum basis of design or other protection product(s) compatible with installed flooring product if Ramboard is not compatible. Products to be used shall be new.
 - i. Tape all edges, seams, etc. with a good quality tape that does not leave sticky residue. Do not allow any debris or other material between the installed flooring and the protection material.
 - ii. Repair tears immediately, replace worn areas with like material as necessary.
 2. Protect carpeted areas as follows:
 - a. Define foot traffic areas and protect with a minimum of 6mil, clear, polyethylene sheeting 3 feet wide. Products to be used shall be new.
 - i. Tape all edges, seams, etc. with a good quality tape that does not leave sticky residue. Do not allow any debris or other material between the installed flooring and the protection material.
 - ii. Repair tears immediately, replace worn areas with like materials as necessary.
 3. Protect all finished walls in high traffic areas with Ramboard Temporary Wall protection products or approved equal.
 - i. Tape all edges, seams, etc. with a good quality tape that does not leave sticky residue. Do not allow any debris or other material between the installed flooring and the protection material.
 - ii. Repair tears immediately, replace worn areas with like materials as necessary.
 3. Protect counter tops, cabinets, and other finished surfaces with large sheets of thick cardboard or Ramboard products. Do not allow toolboxes, finish materials, parts and other such items to be placed on finished materials.
- C. All protection shall stay in place until the CPM, PA, and GC mutually deem the project is ready for Final Cleaning. The contractors responsible for protecting the work shall be responsible for removing the protection and removing any adhesive residue at that time. Contractors shall only use manufacturer authorized cleaning materials for removing adhesives, etc.
- D. Contractors doing work in un-protected areas of finished work shall be required to provide drop cloths and other protection as noted within this specification for the duration of their work.
1. Finished areas shall be sufficiently covered to accommodate all equipment, and materials being used to complete the work being done.
 2. Finished areas shall be sufficiently covered to prevent splatters, over spray, etc. when doing touch-up work.
 3. Contractors who do not provide sufficient protection under this sub-section shall be responsible for any costs associated with cleaning, repairing or replacing already finished construction at no additional cost to the contract.

END OF SECTION

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**SECTION 01 77 00
CLOSEOUT PROCEDURES**

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17

PART 1 – GENERAL

1.1. SUMMARY

- 21 A. The purpose of this specification is to clearly define and quantify the requirements associated with closing a City
22 of Madison Public Works Contract for facility related work.
23 B. All contracts have two distinct but related paths. Each path needs to be properly closed independently in order
24 to close the contract as a whole.
25 1. Construction closeout is related to closing out all of the Work associated with the construction
26 documents.
27 a. It shall be the responsibility of all contractors to be fully aware of the required Work and closeout
28 requirements involved in their individual trades.
29 2. Contract closeout is related to closing out all of the administrative aspects of the contract in general.
30 a. It shall be the responsibility of all contractors to be fully aware of the administrative requirements
31 required by the contract and to provide the supporting documentation required.
32 3. Construction Closeout must be completed before Contract Closeout can begin.
33 C. This specification will provide general knowledge associated with the following areas:
34 1. Construction Closeout Requirements
35 2. Construction Closeout Procedure
36 3. Contract Closeout Requirements
37 4. Contract Closeout Procedure
38 5. Final Payment and Certificate of Completion
39

1.2. RELATED SPECIFICATIONS

- 41 A. Contractors shall review all references to other specifications including specifications relating to the execution of
42 the Work associated with their Division or Trade.
43 B. Section 01 29 76 Progress Payment Procedures
44 C. Section 01 31 23 Project Management Web Site (SharePoint)
45 D. Section 01 32 26 Construction Progress Reporting
46 E. Section 01 32 33 Photographic Documentation
47 F. Section 01 45 16 Field Quality Control Procedures
48 G. Section 01 74 13 Progress Cleaning
49 H. Section 01 45 16 Construction Waste Management and Disposal
50 I. Section 01 76 00 Protecting Installed Construction
51 J. Section 01 78 13 Completion and Correction List
52 K. Section 01 78 23 Operation and Maintenance Data
53 L. Section 01 78 36 Warranties
54 M. Section 01 78 39 As-Built Drawings
55 N. Section 01 78 43 Spare Parts and Extra Materials
56 O. Section 01 79 00 Demonstration and Training
57 P. Section 01 91 00 Commissioning
58 Q. Other requirements as noted in the contract documents signed by the General Contractor

1
2 **1.3. DEFINITIONS**

- 3 A. **Substantial Compliance:** A letter provided to the City of Madison Building Inspection and signed by the Project
4 Architect indicating that all Work has been completed to a level that would allow Owner Occupancy and that all
5 construction is in compliance with the construction documents. A copy of this letter is also provided to the
6 State of Wisconsin Department of Health and Safety as necessary to clear plan review requirements. This letter
7 does not represent construction closeout.
- 8 B. **Certificate of Occupancy:** The Regulatory letter from the City of Madison Building Inspection Department
9 indicating that all regulatory requirements and inspections have been completed and the building may now be
10 occupied for its intended use. This letter does not represent construction closeout.
- 11 C. **Certificate of Substantial Completion:** A letter provided by the Department of Public Works, signed by the City
12 Engineer indicating that Construction activities are substantially complete. This letter does represent
13 construction closeout and the date of this letter begins the date of the Warranty Period.
- 14 D. **Construction Closeout:** The point in the contract where all contractual requirements associated the execution of
15 the Work as described in the plans, specifications, and other documents have been successfully met and the
16 items described in 1.3.A, .B, and .C above have been completed.
- 17 E. **Final Progress Payment:** The progress payment associated with achieving Construction closeout as described in
18 1.3.D above. At this point the contractor may request all monies associated with the contract be paid with the
19 exception of held retainage.
- 20 F. **Contract Closeout:** The point in the contract where all contractual requirements associated with the City of
21 Madison, Board of Public Works contract has been successfully met.
- 22 G. **Final Payment:** The final contract payment submittal that may be approved by the City of Madison after all
23 contractual requirements of the Public Works Contract have been met and any remaining monies (retainage)
24 due to the contractor may be released for the Final Payment.
25

26 **1.4. QUALITY ASSURANCE – CONSTRUCTION CLOSEOUT**

- 27 A. All contractors shall be responsible for properly executing the construction closeout requirements associated
28 with their Work as described in the specifications governing their Work.
- 29 B. The GC shall be responsible for all of the following:
30 1. Ensuring that all contractors have met the construction closeout requirements associated with their
31 Work.
32 2. Coordinate the collection of all construction closeout deliverables from all contractors, provide the
33 deliverables to the Project Architect and City Project Manager for review as necessary, and ensure all
34 contractors correct deficiencies of deliverables and resubmit as needed for final acceptance.
35 3. Ensure all closeout requirements identified in the Construction Closeout Checklist below have been
36 completed as intended by the construction documents.
37

38 **1.5. QUALITY ASSURANCE – CONTRACT CLOSEOUT**

- 39 A. The City of Madison, Department of Civil Rights (DCR) monitors contract compliance for construction and
40 procurement contracts to ensure that local, state and federal regulations are followed by contractors working on
41 City of Madison Public Works (PW) projects. DCR will monitor all PW projects from contract award through the
42 final payment at the close of the project. Contractors will be required to submit reporting paperwork
43 throughout the PW project process.
44 1. Contractors are encouraged to visit the web site identified below for additional information, checklists,
45 forms, and other information provided by DCR as it relates to Contract Compliance.
46 <http://www.cityofmadison.com/Business/PW/contractCompliance.cfm>
47 2. Questions regarding the process should be directed to parties and offices as identified on the various
48 forms, documents, and instructions or contact:
49 City of Madison, Department of Civil Rights
50 210 Martin Luther King Jr. Blvd., Room 523
51 Madison, WI 53703
52 (608) 266-4910
- 53 B. All Sub-Contractors have submitted the applicable required documents described in item 1.5.D below to the
54 General Contractor (GC) for Contract Closeout.
- 55 C. The GC has submitted the required applicable documents described in item 1.5.D below for all contractors to the
56 appropriate City of Madison Agency per instructions associated with each submittal.

- D. The documents required for submittal to the City of Madison for Contract Closeout may include any/all of the items listed below depending on contract type. It is the sole responsibility of all contractors to know and submit the required and complete documentation in a timely fashion.
1. Weekly Payroll Reports
 2. Employee Utilization Reports
 3. Agent or Subcontractor Affidavit of Compliance with Prevailing Wage Rate Determination
 4. Prime Contractor Affidavit of Compliance with Prevailing Wage Rate Determination
 5. Documentation required for Small Business Enterprise (SBE) goals
 6. Other documents as maybe required or requested through the Finalization Review Process

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. CONSTRUCTION CLOSEOUT CHECKLIST

- A. All contractors shall be responsible for reviewing the drawings and specifications within their Divisions of Work to provide a complete and comprehensive list of all Construction Closeout Requirements to the GC.
1. The checklist shall include all items identified within the construction documents that require any of the following (and examples) prior to moving into Contract Closeout Procedures:
 - a. Documents indicating a specified level of performance has been achieved, such as:
 - i. Test reports of all types
 - ii. Startup reports
 - b. Required documentation, such as:
 - i. As-builts and record drawings
 - ii. Operation and maintenance data
 - c. Physical items to be turned over to the owner, such as:
 - i. Attic stock
 - ii. Keys
 - d. Required maintenance completed, such as:
 - i. Ducts cleaned
 - ii. Filters replaced
 - e. Commissioning and LEED related items and submittals
 - f. Owner and Maintenance Training
 - B. Each list shall indicate the title of the closeout requirement, the associated specification of the requirement, the required result or deliverable, the responsible contractor(s), and a column to verify the item has been turned in and completed.
 - C. The GC shall be responsible for all of the following:
 1. Consolidating all the closeout lists into one master Construction Closeout Checklist.
 - a. The checklist shall be in a tabular data format similar to the sample below
 2. Upload the completed checklist to the Contract Closeout-Miscellaneous Documents Library on the Project Management Web Site for review.
 3. Resubmit the checklist as needed after initial reviews have been completed.
 - D. The GC shall work with all contractors to amend the Construction Closeout Checklist throughout the execution of the project based on changes and modifications as necessary.

<u>Title</u>	<u>Specification</u>	<u>Description</u>	<u>Responsibility</u>	<u>Completed</u>
Quality Management Observation Reports	01 45 16	All QMO reports have been properly responded to, reviewed and closed by the CPM/CCM.	All, GC	
As-Built Drawings	01 78 39	As-Built drawings have been reviewed and accepted per the specification	All, GC	
Testing and Balancing of HVAC	23 09 23	Provide final TnB reports indicating design performance has been achieved	HVAC	

3.2. CONSTRUCTION CLOSEOUT REQUIREMENTS

- A. The timely submittal or completion of closeout requirements shall go hand in hand with the Progress Payment Milestone Schedule that can be found in Specification 01 29 76 Progress Payments. No payments shall be made until all requirements for that payment have been met.

- 1 1. The GC and all major Subcontractors, PA, and CPM/CCM, shall review all requirements for
2 Construction/Contract Closeout during two (2) special meetings.
- 3 a. The first meeting shall be held at the 50% Contract Total Payment milestone. This meeting shall
4 discuss the requirements associated with various construction/contract closeout documentation
5 and events when they are due with respect to progress payments.
- 6 b. The second meeting shall be held at the 70% Contract Total Payment milestone. This meeting
7 shall review the contractors progress regarding the closeout checklist, begin making plans for
8 upcoming deadlines such as scheduling training, where to put attic stock, and when they are due
9 with respect to progress payments.
- 10 2. The GC, PA, and CPM/CCM, shall utilize the Construction Closeout checklist to ensure that all
11 construction closeout requirements have been met.

12
13 **3.3. CONSTRUCTION CLOSEOUT PROCEDURE**

- 14 A. Upon successful completion and final acceptance of all Construction Closeout Requirements the GC may submit
15 to the CPM/CCM and PA the request for Final Progress Payment (100% contract total, less retainage).
- 16 B. The PA will confirm with the design consultants, CPM/CCM, and other City of Madison staff that all requirements
17 of the Work have been completed and will do the following:
 - 18 1. Approve the final progress payment application
 - 19 2. Provide the required signed payment documents to the CPM/CCM
 - 20 3. Provide the required Letter of Substantial Compliance to the following as required:
 - 21 a. State Safety and Building Division
 - 22 b. Local Building Inspection office
 - 23 c. GC
 - 24 d. CPM/CCM
- 25 C. The CPM/CCM shall draft the City Letter of Substantial Completion for signature by the City Engineer. This letter
26 shall state any of the following that may still be tied to the contract and/or warranty:
 - 27 1. Indicate that the date of the letter shall also be the beginning of the Warranty period.
 - 28 2. Indicate any allowed due outs, reasons for them, and anticipated dates of finalization.
 - 29 a. QMO issues such as off season testing of equipment
 - 30 b. Off season training of equipment
- 31 D. The GC and all subcontractors shall finalize all warranty letters associated with their Work using the date noted
32 on the City Letter of Substantial Completion, and provide the CPM/CCM with all warranties as described in
33 Specification 01 78 36 Warranties. Upon receipt and final approval of the Warranties the CPM/CCM may initiate
34 final processing of the Final Progress Payment (100% contract total, less retainage).

35
36 **3.4. CONTRACT CLOSEOUT REQUIREMENTS**

- 37 A. The GC and all sub-contractors shall follow all requirements associated with documenting contract compliance
38 and provide documentation as required or requested by DCR or PW staff. All contractors are encouraged to stay
39 current with submissions of the following documentation:
 - 40 1. Weekly Payroll Reports no later than the Progress Payment equal to 50% of the contract total.
 - 41 2. Employee Utilization Reports
 - 42 3. Agent or Subcontractor Affidavit of Compliance with Prevailing Wage Rate Determination
 - 43 4. Prime Contractor Affidavit of Compliance with Prevailing Wage Rate Determination
 - 44 5. Documentation required for Small Business Enterprise (SBE) goals
 - 45 6. Other documents as maybe required or requested through the Finalization Review Process
- 46 B. Near the Progress Payment equal to 80% of the contract total the GC shall request in writing a Finalization
47 Review. At that time DCR or PW staff shall prepare a report of all contract documentation submitted to date. A
48 list of missing items or outstanding issues will be emailed to the GC. No additional follow-up will be generated
49 by DCR or PW Staff.

50
51 **3.5. CONTRACT CLOSEOUT PROCEDURE**

- 52 A. The Contract Closeout Procedure will not begin until the Construction Closeout Procedure has been completed.
- 53 B. When the GC feels he/she has successfully met all of the Contract Closeout Requirements associated with
54 Section 3.3 above the GC may submit to the request for Final Payment to the CPM/CCM.
- 55 C. The CPM/CCM shall sign and submit the Final Payment request for processing.
- 56 D. DCR and PW staff shall do a complete review of all documentation associated with item 3.3.A above.

- 1 E. The GC shall be notified directly by DCR or PW Staff of any documentation that may still be missing, have
- 2 incomplete information, or other outstanding issues. It shall be the responsibility of the GC to continue follow-
- 3 up with DCR and PW staff until all documentation has been successfully submitted and accepted.
- 4 F. When all required documentation associated with Contract Closeout has been successfully submitted and
- 5 accepted by DCR and PW Staff the City of Madison shall process the Final Payment of any remaining monies
- 6 including retainage.
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9 **END OF SECTION**

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**SECTION 01 78 13
COMPLETION AND CORRECTION LIST**

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15

PART 1 – GENERAL

1.1. SUMMARY

- 19 A. The City of Madison has developed a multi-faceted Quality Management Program that begins with contract
20 signing and runs through contract closeout to ensure the best quality materials, workmanship, and product are
21 delivered for the contracted Work.
22 1. Progress Payment Milestones have been created to ensure the contractor is meeting required
23 administrative milestones associated with the progression of the Work and the Contract at the
24 appropriate time.
25 2. The Progress Management Web Site (SharePoint) is a Construction Management tool that provides
26 contractors, consultants, and staff a single on-line location for the daily operations and progression of the
27 Work.
28 3. The Quality Management Observation (QMO) is an ongoing observation of the construction process as it
29 progresses.
30 4. Closeout Procedures have been implemented to assist the Contractor in closing out both the
31 Construction and Administrative aspects of the Contract.
32 5. The Completion and Correction List (the Punch List) is intended to be the final summary of corrections
33 required by all contractors to close out the construction portion of the contract.
34 B. All contractors shall be required to review the specifications identified in Section 1.2 below, and other related
35 specifications identified therein to become familiar with the terminology and expectations of this City of
36 Madison Public Works contract.
37 C. Work identified as not in compliance with the contract documents by the Project Architect, City Project
38 Manager/Construction Manager, Owner, Owner Representatives, Owner Consultants, etc. shall be resolved
39 immediately at the Contractor’s expense.
40 1. Unresolved issues will be subject to withholding of progress payment(s) until completed.
41

1.2. RELATED SPECIFICATIONS

- 42 A. Section 01 29 76 Progress Payment Procedures
43 B. Section 01 31 23 Project Management Web Site (SharePoint)
44 C. Section 01 45 16 Field Quality Control Procedures
45 D. Section 01 74 13 Progress Cleaning
46 E. Section 01 77 00 Closeout Procedures
47
48

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION

3.1. QUALITY MANAGEMENT OBSERVATIONS (QMO)

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53 A. The Quality Management Observation (QMO) process acts as an “in progress punch list” for contractors to
54 review and correct before the work gets buried and difficult to correct.
55 B. All Contractors should become familiar with the QMO process described in detail in specification 01 45 16 Field
56 Quality Control Procedures.
57
58

1 **3.2. PUNCH LIST REVIEW SCHEDULING**

- 2 A. The General Contractor (GC), Project Architect (PA), City Project Manager (CPM) and City Construction Manager
3 (CCM) shall schedule time for the PA, Consultants, Commissioning Agent (CxA), Owner, and Owner
4 Representatives to walk through the project area for a final review of the Work.
5 1. Scheduling shall be determined during the Construction/Contract Closeout Meeting #2 at approximately
6 70% Contract Total (CT, partial payment milestone in Specification 01 29 76 Progress Payment
7 Procedures).
8 a. Scheduling shall be of sufficient duration to allow all reviewers and all contractors ample time to
9 review all installations, final performance reports and other required data.
10 2. The Punch List Review shall not be conducted prior to achieving the 90% CT. In addition, the following
11 must be completed or in progress at the time of Punch List Review:
12 a. Finishes shall be 90% complete or better
13 b. Landscaping shall be at 90% complete or better
14 c. Testing and Balancing has been completed
15 d. Demonstration and Training is in progress
16 e. Large equipment, gang boxes, excess construction materials, and similar items have been
17 removed from the site.
18 f. Progress cleaning shall be maintained to a level of post finish installation as described in
19 Specification 01 74 13 Progress Cleaning, Section 3.3.B or Section 3.4.
20 3. The Punch List Review Corrections shall be completed before the 90% CT milestone has been completed.
21 a. Final cleaning shall not begin before corrections list has been completed.
22

23 **3.3. REVIEWING WORK TO COMPLETE**

- 24 A. All Work shall be subject to the Punch List Review for compliance with the intent of the contract documents.
25 B. The intent of the Punch List Review is not to identify every cosmetic irregularity except where it is due to poor
26 workmanship or poor materials.
27 1. Minor cosmetic irregularities such as paint scuffs, floor scuffs, dusty finish, etc. may be recorded as a
28 general comment.
29 a. The GC and all contractors shall be responsible for protecting all finished Work and repairing
30 damaged Work as often as needed until final acceptance of the Work.
31

32 **3.4. RECORDING WORK TO COMPLETE**

- 33 A. There is no specified format for recording work to complete during the Punch List Review. PA, Consultants, CxA,
34 Owner, and All Contractors may use their own local version provided they meet the following minimum
35 requirements:
36 1. Formats shall be tabular in nature (IE. Spread sheet)
37 a. Final copies shall be digital files capable of being copied and pasted into other programs
38 2. Includes the following fields;
39 a. Name of person recording the item
40 b. Floor
41 c. Room Number
42 d. Room Name
43 e. Item Description
44 f. Division of Work associated with item
45 3. The City of Madison shall use an excel spreadsheet similar to the sample shown at the end of this
46 specification.
47 B. The PA shall be responsible for gathering final punch lists of all consultants under their control.
48 C. The CPM/CCM shall be responsible for gathering final punch lists of City Staff, Owner, and CxA.
49 D. The PA and CPM/CCM shall provide the GC with duplicate copies of punch lists collected.
50


51 **3.5. GENERAL CONTRACTORS RESPONSIBILITIES**

- 52 A. The GC shall ensure that all sub-contractor forepersons or project managers are present at the required time(s)
53 to assist in the punch list review.
54 B. The GC shall receive the completed punch list reviews from the PA, CPM/CCM, and all sub-contractors.
55 1. The GC shall be responsible for compiling a master roll up of all reviews into a format or software
56 program of the GC's preference.
57 a. The master roll up shall remove all duplications.
58 b. Each item shall indicate the contractor or vendor responsible for the item.

- 1 c. Each item shall indicate the date item was completed.
- 2 d. Each item shall include signature/date sign-offs for contractor/vendor, GC, PA/Consultant, CxA,
- 3 CPM/CCM.
- 4 2. The GC shall distribute the master roll up to the PA, Consultants, CPM/CCM, CxA, Owner/Owner Reps,
- 5 and all contractor project managers.
- 6 C. The GC shall schedule a date for completing the punch list corrections with all contractor project managers.
- 7 D. The GC shall notify the PA and CPM/CCM when all punch list corrections have been completed.
- 8

3.6 FINAL REVIEW

- 9
- 10 A. All Punch List Items are subject for final review by the contractor, PA/Consultant, CPM/CCM, CxA, Owner/Owner
- 11 Rep at any time after being notified that the correction has been completed.
- 12 1. If the originator of an item is not satisfied with corrections the item shall not be closed until such time as
- 13 it has been satisfactorily completed.
- 14 2. Work that was not completed at the time of the Punch List Review may be added to the list at this time.
- 15 B. A final walk through will be conducted with the GC, PA, CPM/CCM before issuing the City Letter of Substantial
- 16 Completion will be issued. This walk through shall ensure all elements of the construction closeout procedures
- 17 are completed.
- 18
- 19
- 20

 <p>City of Madison <Project Name> <Contract Number> <Name of Reviewer> <Date of Review></p>						
<u>Punch List Work to Complete</u>						
<i>Floor #</i>	<i>Room #</i>	<i>Room Name</i>	<i>Item Description</i>	<i>Division</i>	<i>Remarks</i>	<i>Completed</i>

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END OF SECTION

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SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

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15 3.3. O&M/U&C DATA FINAL SUBMITTAL 4
16 3.4. CONSTRUCTION CLOSEOUT 4
17

PART 1 – GENERAL

1.1. SUMMARY

- 21 A. The purpose of this specification is to provide clear responsibilities and guide lines related to providing well
22 documented and complete Operation and Maintenance (O&M) Data related to general facility use, equipment,
23 systems, finishes, and materials to City of Madison Staff (Owner, Owner Representatives, Maintenance, and
24 Custodial Personnel) as needed.
25 B. Operation and Maintenance Data shall apply to both of the following categories except where specific
26 requirements are noted under their separate titles as follows:
27 1. Operation and Maintenance Data: Generally shall mean the owner manual that provides information on
28 start-up, shut-down, operation, troubleshooting, maintenance, parts, and other such documentation as it
29 pertains to all equipment and systems installed under the Work.
30 a. For the rest of this specification this shall be designated as O&M.
31 2. Use and Care instructions: Where applicable use and care instructions shall also be considered O&M for
32 such things as flooring, tile, partitions, and other such finishes and trim related items, installed under the
33 Work.
34 a. For the rest of this specification this shall be designated as U&C.
35

1.2. RELATED SPECIFICATIONS

- 36 A. Section 01 29 76 Progress Payment Procedures
37 B. Section 01 31 23 Project Management Web Site (SharePoint)
38 C. Section 01 77 00 Closeout Procedures
39 D. Section 01 78 13 Completion and Correction List
40 E. Section 01 78 19 Maintenance Contracts
41 F. Section 01 78 36 Warranties
42 G. Section 01 79 00 Demonstration and Training
43 H. Section 01 91 00 Commissioning
44 I. Other Divisions and Specifications that may address more specifically the requirements for O&M/U&C Data.
45
46

1.3. QUALITY ASSURANCE

- 47 A. All O&M/U&C Data shall meet the requirements identified in Section 1.4 below.
48 B. All contractors shall provide O&M/U&C Data for each piece of equipment, system, or finish installed during the
49 installation of the Work. O&M/U&C Data shall be provided to the General Contractor (GC) for verification and
50 submittal.
51 C. The GC shall be responsible for receiving all required O&M/U&C Data files from all contractors and for verifying
52 that all files submitted meet the requirements in Section 1.4 below.
53
54

1.4. O&M/U&C DATA REQUIREMENTS

- 55 A. O&M/U&C Data shall be provided in digital PDF format as follows:
56 1. PDF files shall be complete first generation consumer useable editions of PDF documents as provided by
57 any of the following:
58

- 1 a. Product manufacturer
- 2 b. Supplier of product
- 3 c. Product manufacturer internet site
- 4 2. Acceptable PDF files shall have the following functionality:
- 5 a. Word searchable
- 6 b. Key areas are bookmarked
- 7 c. Table of Contents and/or Index linked to content is preferred whenever possible.
- 8 3. Scanned printed material, with word searchable capabilities, saved as a PDF, is not acceptable and will be
- 9 rejected without further review.
- 10 B. O&M/U&C Data shall include but not be limited to the following manufacturers' published information as
- 11 appropriate for the equipment, system, material, or finish:
- 12 1. Installation instructions
- 13 2. Parts lists, assembly diagrams, explosion diagrams
- 14 3. Wiring diagrams
- 15 4. Start-up, shut-down, troubleshooting and other related operation procedures
- 16 5. Lubrication, testing, parts replacement, and other such maintenance procedures
- 17 6. General use, care, and cleaning instructions
- 18 7. Special precautions and safety requirements
- 19 8. A list of certified equipment vendors, service companies, parts suppliers including company name,
- 20 address, and phone number
- 21 9. A list of the recommended spare parts to have on hand at all times
- 22 10. A list by type of all recommended lubes, oils, packing material, and other maintenance supplies
- 23 11. Copies of final test reports, balance reports, and other related documentation
- 24 12. Warranty information for equipment and systems

25
26 **1.5. O&M/U&C DATA SUBMITTALS**

- 27 A. O&M/U&C Data shall be prepared as identified in this specification and shall be submitted for review as per the
- 28 schedule identified in Specification Section 01 29 76, Progress Payment Procedures.
- 29 B. O&M/U&C Data Draft submittals will be reviewed for content, procedure, and compliance only. A general
- 30 critique with recommendations for improvement will be made but re-submittals will not be required.
- 31 C. O&M/U&C Data Final submittals will be reviewed for content, procedure, and compliance. Re-submittals will be
- 32 required until such time as each submittal is accepted.

33
34 ***NOTE:** Acceptance of O&M/U&C Data Final submittals is required to be complete prior to scheduling and conducting*

35 *owner related training and construction closeout.*

36
37 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

38
39 **PART 3 - EXECUTION**

40
41 **3.1. O&M/U&C DATA CHECKLIST**

- 42 A. At the beginning of the contract all contractors shall be responsible for reviewing the drawings and specifications
- 43 within their Divisions of Work to provide a complete and comprehensive list of all O&M/U&C requirements to
- 44 the GC.
- 45 B. The GC shall be responsible for all of the following:
- 46 1. Consolidating all of the O&M/U&C lists into one master O&M/U&C Checklist.
- 47 a. The checklist shall be in a tabular data format similar to the sample below in Section 3.2.
- 48 2. Upload the completed checklist to the Submittal Library on the Project Management Web Site
- 49 (SharePoint) for review. See Specification 01 33 23 Submittals for more information on this procedure.
- 50 3. Resubmit the schedule as needed after initial reviews have been completed.

51
52 **3.1. O&M/U&C DATA PREPARATION - GENERAL**

- 53 A. All contractors shall prepare O&M/U&C Data for draft and final submission as follows:
- 54 1. Obtain digital PDF files for each piece of equipment, system, material or finish as described in Sections
- 55 1.4.A.1 and 1.4.A.2 above.
- 56 2. Verify that all information as described in Section 1.4.B above is included with the PDF file. Obtain
- 57 missing information as necessary for a complete submittal.
- 58 B. Rename each individual PDF file as follows.

1. Do not use special characters such as #, %, &, /, etc. These characters are reserved by the Project Management Web Site (SharePoint) software the City of Madison uses; however the under-score (or under-bar) ‘_’ is an allowed character.
2. Use the following format and examples for renaming your file:
 - a. Format: **Equipment name_What_CONTRACT T.B.D._Year**
 - i. *Equipment Name* represents the name of any equipment, system, material or finish as designated in the Contract Documents.
 - ii. *What* represents what the file is about use only the following:
 - Use **O&M** for Operation and Maintenance manuals
 - Use **U&C** for Use and Care instruction manuals
 - iii. *CONTRACT T.B.D.* is the specific identification number the Work was bid under and appears on the plan set title sheet and in each sheet title block
 - iv. *Year* represents the year the contract will be closed out
 - b. Examples of file names to be used for this contract are:
 - i. AHU 2_O&M_8162_2019
 - ii. CPT 2_U&C_8162_2019
- C. All contractors shall submit the completed digital PDF files to the GC in sufficient time for the GC to meet the O&M/U&C Data submission deadlines as described in Specification Section 01 29 76, Progress Payment Procedures.
- D. O&M/U&C Data shall be submitted and reviewed as described in sections 3.2 and 3.3 below.

3.2. O&M/U&C DATA DRAFT SUBMITTAL

- A. All contractors shall prepare and submit the following for an O&M/U&C Data Draft review submittal:
 1. Provide a complete list of required O&M/U&C submittals to be furnished for review prior to contract closeout, submit the list to the GC for consolidation.
 - a. Review the administrative submittal drawing established by the GC at the beginning of the contract.
 - b. Review specifications, drawings, Construction Bulletins, RFIs and other information that may have changed the Work during the contract.
 - c. Append the original submitted master list as needed.
 - d. Where multiple units of the exact same model and function have been installed only one O&M/U&C shall be required. The title shall incorporate equipment identifiers or finish designations for clarity.
 - e. GC shall provide a consolidated checklist similar to this example for all O&M/U&C submittals to be provided prior to closeout.

<u>Title</u>	<u>O&M or U&C</u>	<u>Specification</u>	<u>Completed (date)</u>
Overhead Door Operator	O&M	08 36 00	
Air Handling Unit (AHU-1 & 2)	O&M	23 00 00	
Air Handling Unit (AHU-3)	O&M	23 00 00	
Carpet (CPT-2)	U&C	09 68 00	

2. Each contractor providing equipment or finished materials shall provide a minimum of one (1) and a maximum of three (3) draft submittals based on their total final O&M/U&C submittal requirements. The GC shall be responsible for determining the total draft requirements for each contractor.
- B. The GC shall be required to review all contractors’ samples and checklists for compliance with this specification and shall return any to the originating contractor that are insufficient for re-submittal.
 1. When acceptable to the GC, he/she shall upload each O&M/U&C Data draft submittal file to the O&M Draft library on the Project Management Web Site (SharePoint).
- C. The Project Architect, City Project Manager, CxA, Consulting Staffs and Owner Representatives shall review the O&M/U&C Data draft submittals and checklist within fifteen 15 working days as follows:
 1. Provide general critique comments by Division on O&M/U&C Data samples submitted. Critique is intended to provide all contractors with information on strengths and weaknesses of their submittals.
 - a. Re-submittal of the O&M/U&C Data samples will not be required.
 2. Review in detail the O&M/U&C Data Checklist for completeness. Provide comments as needed.
 - a. Re-submittal of the O&M/U&C Checklist will be required until accepted.

1 **3.3. O&M/U&C DATA FINAL SUBMITTAL**

- 2 A. All contractors shall prepare and submit the following for an O&M/U&C Data Final review submittal:
- 3 1. Prepare complete O&M/U&C Data files as described in Section 3.1 above according to their approved
- 4 checklist as described in Section 3.2 above.
- 5 2. Submit completed checklist and all final O&M Data files to the GC for final submittal review.
- 6 B. The GC shall be required to spot check all contractors' submittals for completeness against their checklists and
- 7 for compliance with this specification and shall return any to the originating contractor that are insufficient for
- 8 re-submittal.
- 9 1. When acceptable to the GC, he/she shall upload each O&M/U&C Data final submittal file to the O&M
- 10 Final library on the Project Management Web Site (SharePoint).
- 11 C. The Project Architect, City Project Manager, CxA, Consulting Staffs and Owner Representatives shall review the
- 12 O&M/U&C Data final submittals and checklist within fifteen (15) working days as follows:
- 13 1. Review the files submitted against the checklist and request any missing files through the GC.
- 14 2. Review in detail all of the O&M/U&C Data files for completeness.
- 15 a. Submittals shall be accepted or rejected as individual PDF files.
- 16 b. Contractors shall re-submit entire O&M/U&C submittal if any portion is rejected or incomplete.
- 17

18 **3.4. CONSTRUCTION CLOSEOUT**

- 19 A. All contractors shall review Specification 01 77 00, Closeout Procedures and Specification 01 79 00
- 20 Demonstration and Training.
- 21 1. Acceptance of all final O&M/U&C Data submittals is required prior to scheduling Demonstration and
- 22 Training Sessions.
- 23 2. Completion of all Demonstration and Training Sessions is required to receive the Substantial Compliance
- 24 for Occupancy Certificate, and to begin Construction Closeout procedures.
- 25
- 26
- 27
- 28
- 29

END OF SECTION

SECTION 01 78 36
WARRANTIES

1
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PART 1 – GENERAL

1.1. SUMMARY

- 19
20 A. The purpose of this specification is to provide clear responsibilities and guide lines related to providing all
21 Warranties and Guarantees related to the Work, workmanship, materials, equipment, and other such items
22 required by the Construction Documents.
23 B. Manufacturers’ disclaimers and limitations on product warranties do not relieve any contractor of the warranty
24 on the Work that includes the product.
25 C. Manufacturers’ disclaimers and limitations on product warranties do not relieve suppliers, manufacturers and
26 any contractor required to provide special warranties under the contract documents.
27

1.2. RELATED SPECIFICATIONS

- 28
29 A. Section 01 29 76 Progress Payment Procedures
30 B. Section 01 31 23 Project Management Web Site (SharePoint)
31 C. Section 01 77 00 Closeout Procedures
32 D. Section 01 78 23 Operation and Maintenance Data
33 E. Section 01 91 00 Commissioning
34 F. Other Divisions and Specifications that may address more specifically the requirements for Warranties related to
35 the installation of all items and equipment installed under the execution of the Work.
36

1.3. DEFINITIONS

- 37
38 A. See specification 01 77 00 for the definitions of the following terms that may also be used in this specification:
39 1. Substantial Compliance
40 2. Certificate of Occupancy
41 3. Certificate of Substantial Completion
42 4. Construction Closeout
43 5. Contract Closeout
44 B. Emergency Repair: The Owner or Owner Representative reserves the right to make emergency repairs as
45 required to keep equipment or materials in operation or to prevent damage to property and injury to persons
46 without voiding the contractors warranty or bond or relieving the contractor of his/her responsibilities during
47 the warranty period.
48 C. Installer: The company or contractor hired to install a finished product that was manufactured and supplied
49 specifically for the Work within this contract. The Installer may or may not be the same company that supplied
50 the product. See the definition for supplier.
51 D. Supplier: Any company that makes a specific finished product for the Work from information within the Contract
52 Documents. Examples of suppliers would include custom cabinets, steel stairs and railings, etc. A supplier would
53 not be a company that distributes items manufactured by others such as an electrical or plumbing supplier.
54 E. Warranty: A written guarantee from the manufacturer to the owner on the integrity of a product and its
55 installation, and the manufacturers’ responsibility to repair or replace the defective product or components
56 within a specified time from the date of ownership. Warranty may also be used interchangeably with
57 Guarantee. The following warranty types may be part of any specification within the Work associated with the
58 Construction Documents:

- 1 2. Expressed Warranty: A warranty that provides specific repair or replacement for covered components of
- 2 a product over a specified length of time.
- 3 2. Implied Warranty: A warranty that is not stated explicitly by a seller or manufacturer that the product is
- 4 merchantable and fit for the intended purpose.
- 5 3. Standard Product Warranty: Preprinted written warranties published by individual manufacturers for
- 6 particular products and are specifically endorsed by the manufacturer to the Owner. Standard warranties
- 7 may be for any amount of time but shall not be for anything less than one (1) year from the warranty
- 8 date.
- 9 4. Special Warranty: A written warranty required by the Contract Documents either to extend the time
- 10 limit provided under a standard warranty or to provide greater rights to the Owner.
- 11 F. Warranty Date: The effective date that begins all warranty periods required for products, installations, and
- 12 work-manship associated with the execution of the Work for this contract. The Warranty Date shall be set by
- 13 the CPM.
- 14 G. Related Damages and Losses: When correcting failed or damaged Warranted Work, remove and reinstall (or
- 15 replace if necessary) the construction that has been damaged as a result of the failure or the construction that
- 16 must be removed and replaced to obtain access for the correction of Warranted Work.
- 17 H. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected reinstate the
- 18 warranty by a new written endorsement. The reinstated warranty shall be equal to the original warranty with an
- 19 equitable adjustment for depreciation unless specifically noted otherwise in a specification.
- 20 I. Replacement Cost: All costs that may be associated with Work being replaced under warranty including but not
- 21 limited to the following:
- 22 1. Related damages and losses
- 23 2. Labor, material and equipment
- 24 3. Permits and inspection fees
- 25 4. This shall be regardless of any benefit the Owner may have had from the Work through any portion of its
- 26 anticipated useful service life.
- 27 J. Replacement Work: All materials, products, required labor, and equipment necessary to replace failed or
- 28 damaged warranted to an acceptable condition that complies with the requirements of the original Construction
- 29 Documents.
- 30 K. Owners Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not
- 31 limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods
- 32 shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations,
- 33 rights, and remedies.
- 34 1. Rejection of Warranties: The Owner reserves the right to reject any warranty and to limit the selection of
- 35 products with warranties not in conflict with the requirements of the contract documents.
- 36 2. Where the Contract Documents require a Special Warranty or similar commitment on the Work or
- 37 product, the Owner reserves the right to refuse acceptance of the Work until the Contractor presents
- 38 evidence the entities required to countersign such required commitments have done so.
- 39

40 1.4. GENERAL CONTRACTORS RESPONSIBILITIES

- 41 A. The General Contractor (GC) shall be responsible to remedy, at his/her expense, any defect in the Work and any
- 42 damage to City owned or controlled real or personal property when the damage is a result of:
- 43 1. The GC's failure to conform to Contract Document requirements.
- 44 a. Any substitutions not properly approved and authorized may be considered defective.
- 45 2. Any defect in workmanship, materials, equipment, or design furnished by the GC or Sub-contractors.
- 46 B. All warranties as described in this specification and these Contract Documents shall take effect on the date
- 47 established by the CPM, as noted in Section 1.3F above.
- 48 1. All warranties shall remain in effect for one (1) year thereafter unless specifically stated otherwise in the
- 49 Contract Documents or where standard manufacturer warranties are greater.
- 50 C. The GC's warranty with respect to Work repaired or replaced, including restored or replaced Work due to
- 51 damage, will run for one (1) year from the date of Owner Acceptance of said repair or replacement.
- 52 1. This shall be regardless of any benefit the Owner may have had from the Work through any portion of its
- 53 anticipated useful service life.
- 54 D. Warranty Response
- 55 1. See Section 3.5 of this specification.

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. WARRANTY CHECKLIST

- A. All contractors shall be responsible for reviewing the drawings and specifications within their Divisions of Work to provide a complete and comprehensive list of all Warranty Requirements to the GC.
- B. Each list shall indicate the title (and plan identifier when applicable) of the warranted item, the associated specification of the warranted item, the terms of the warranty (years), and a column to verify the item has been turned in and completed.
- C. The GC shall be responsible for all of the following:
 - 1. Consolidating all the warranty lists into one master Warranty Checklist.
 - a. The checklist shall be in a tabular data format similar to the sample below.
 - 2. Upload the completed checklist to the Submittal Library on the Project Management Web Site (SharePoint) for review. See Specification 01 33 23 Submittals for more information on this procedure.
 - 3. Resubmit the schedule as needed after initial reviews have been completed.
- D. The GC shall work with all contractors to amend the Warranty Checklist throughout the execution of the project based on changes and modifications as necessary.

<u>Title</u>	<u>Specification</u>	<u>Terms</u>	<u>Completed</u>
Overhead Door Operator	08 36 00	MFR 2yr	
Exterior Bench and Trash Receptacles	12 93 00	MFR 3 year warranty on finish	
Kitchen Sink (SK-1)	22 42 00	MFR 5 year	
Disposal (D-1)	22 42 00	MFR 7 year parts and in-home service	
Toilet (WC-1)	22 42 00	MFR 1 year limited	

3.2. LETTERS OF WARRANTY

- A. All letters of warranty shall be in a typed letter format and provide the following information:
 - 1. The letter shall be on official company stationary including company name, address, and phone number.
 - 2. Indicate Olbrich Botanical Gardens Expansion Project 1, CONTRACT 8162, and contract address the warranty is for on the reference line.
 - 3. Provide a description of the warranty(ies) being provided.
 - a. Include Division, Trade, or Specification information as necessary.
 - b. Only combine warranties of related Divisional Work together. Create new letters for additional Divisions as necessary.
 - 4. Indicate the effective Warranty Date. As noted in Section 1.3.F above, the Warranty Date shall be the date the Certificate of Substantial Completion was signed by the City Engineer.
 - 5. Contractor Letters of Warranty shall only be signed by a principal officer of the company.
 - 6. After signing the letter provide the GC with a high quality color scanned image in PDF format and the original signed letter.
- B. The GC shall be responsible for the Final Warranty submittal as identified in Section 3.4 below.
- C. The GC shall obtain letters of warranty from all of the following:
 - 1. The General Contractor shall provide warranty letters for all Work that was self performed under the contract documents, identify all trades or Divisions of Work.
 - 2. All Sub-contractors shall provide warranty letters for Work performed under the contract documents; identify all trades or Divisions of Work.
 - 3. Suppliers, as required by other specifications within the Construction Documents where the manufacture of a specific product unique to the Work of this contract was required.
 - a. The terms and conditions of the Supplier Letter of Warranty shall be as defined by the specifications associated with the Work but shall not be less than the industry standard of repair, or replace defective materials and workmanship within one (1) year of the warranty date.
 - b. When the supplier is also the installer a single written letter may be submitted identifying both the warranty for the manufacture of the product and the warranty for the installation of the product.
 - 4. Installers as required by other specifications within the Construction Documents where the installation of a specific product unique to the Work of this contract was required.

- 1 1. The terms and conditions of the Installer Letter of Warranty shall be as defined by the
2 specifications associated with the Work but shall not be less than the industry standard of repair,
3 or replace defective materials and workmanship associated with the installation of the product
4 within one (1) year of the warranty date.
5 5. Special Letters of Warranty shall be required from any contractor, supplier, installer or manufacturer who
6 agrees to provide warranty services required by any Division Specification in excess of their Standard
7 Product Warranty.
8

9 **3.3. STANDARD PRODUCT WARRANTY**

- 10 A. All contractors shall be responsible for collecting and providing copies of all standard product warranties for
11 commercially available products purchased and installed under this contract.
12 B. Only one copy of the manufacturers' standard warranty needs to be submitted as representative for all
13 quantities of the same model number used throughout the Work.
14 C. Provide the manufacturers certificate, letter, or other standard documentation for each Standard Product
15 Warranty submitted as follows:
16 1. Whenever possible a PDF version of the document shall be used.
17 a. If a PDF version is used all additional information shall be completed using simple PDF editing
18 tools such as text boxes, highlight, etc.
19 b. If a PDF version is not available and an original document is furnished the additional information
20 shall be neatly hand written and highlighted on the document in such a fashion so that it does not
21 obscure any part of the written warranty.
22 2. Provide the following additional information on each warranty document:
23 a. Contract warranty date.
24 b. Provide the manufacturer name and model number of the product if not specified within the
25 warranty.
26 i. Where the manufacturer name and model number is specified within the warranty it shall
27 be highlighted for visibility.
28 c. Provide the plan identifier (LAV-1, WC-2, etc) when applicable.
29 D. Each completed warranty shall be saved as a digital PDF. The file shall be named using the specification number
30 and item description. I.E. 22 42 00 Toilet (WC-1).pdf
31 a. Where an original certificate was furnished provide a high quality colored scan of the completed
32 document with the additional information. Save the scanned image in PDF format and use the
33 same naming convention as indicated above.
34 E. Provide all PDF files and any original documents to the GC for final consolidation to be provided to the Owner.
35

36 **3.4. FINAL WARRANTY SUBMITTAL**

- 37 A. The GC shall receive all required warranties (digital PDF and any original documents) from all contractors,
38 suppliers, installers and manufacturers.
39 B. The GC shall inventory all received warranties with the Warranty Submittal List to ensure all required warranties
40 have been received and all warranty periods are correct according to the specifications.
41 C. Provide with each Operation and Maintenance Manual a complete copy of any associated warranty.
42 D. Scan all warranties into a single organized electronic PDF file as follows:
43 1. Organize the PDF file into an orderly sequence based on the table of contents of the Specifications.
44 2. Provide a typed Table of Contents for the entire file at the front of the document.
45 3. Provide bookmarks and links to each individual PDF to enable quick navigation through the PDF
46 document.
47 E. Upload the warranty submittal to the appropriate document library on the Project Management Web Site
48 (SharePoint) for review by the PA and CPM.
49 F. Correct any deficiencies or omissions and resubmit as necessary.
50

51 **3.5. WARRANTY NOTIFICATION, RESPONSE, EXECUTION AND FOLLOW-UP**

- 52 A. Warranty Notification:
53 1. The City of Madison, Project Management Web Site (SharePoint), uses an email notification system for all
54 warranty related issues. The GC will be required to provide, and keep current during the warranty
55 period, a minimum of two (2) email addresses and phone numbers of current employees to receive email
56 notifications and provide response regarding Work associated with these construction documents.

- 1 a. In the event a Warranty Issue is deemed by the City of Madison to be an emergency, the GC shall
2 first receive a phone call with a follow-up email from the Project Management Web Site
3 (SharePoint).
- 4 b. The Contract Closeout-Warranty Issue Library on the Project Management Web Site (SharePoint)
5 uses a form for each warranty issue that is logged into the system.
- 6 i. The GC shall open each warranty issue form, review the issue description and any attached
7 documentation or photos.
- 8 ii. The GC shall also notify any other sub-contractor, supplier, or installer that may be
9 required to review the warranty issue.
- 10 B. Warranty Response:
- 11 1. The GC shall upon notification by the City of Madison provide warranty response as follows:
- 12 a. Critical Systems or equipment: Where damage to equipment and other building components, or
13 injury to personnel is probable provide immediate emergency shut-down information and an on-
14 site response team as soon as possible but in no case shall on-site response exceed 24 hours.
- 15 b. For non-critical responses where damage or injury is unlikely provide on-site response no later
16 than the next business day.
- 17 c. Where Technical Assistance support is part of the written warranty provide all assistance
18 necessary via phone, text, or internet systems as indicated by the warranty. If issues cannot be
19 resolved provide on-site response no later than the next business day.
- 20 d. If the request cannot be supported in sufficient time as outlined above the Owner (or Owner
21 Representative) reserves the right to contact other contractors or service companies having
22 similar capability to expedite the repair or replacement and shall invoice all associated costs to
23 the Owner back to the GC.
- 24 C. Warranty Execution:
- 25 1. The GC shall provide all repairs or replacements as necessary to restore broken or damaged Work to the
26 original level of acceptance as intended by the Contract Documents.
- 27 a. Provide all materials, equipment, products, and labor necessary to complete the repair or
28 replacement associated with the Warranty Issue.
- 29 b. Provide all cleaning services as may be required before, during, and after the repair or
30 replacement as per Specification 01 74 13 Progress Cleaning.
- 31 c. Provide any protection necessary for existing construction as per Specification 01 76 00 Protecting
32 Installed Construction
- 33 d. Provide new letters of warranty when required.
- 34 D. Warranty Follow-up:
- 35 1. Logged Warranty Issues:
- 36 a. The GC shall provide complete documented responses of all logged Warranty Issues. Responses
37 shall provide a description of work completed, by who, inclusive dates, and photos of completed
38 or repaired work.
- 39 i. Provide call back response if work is not acceptable.
- 40 b. The City Project Manager shall review the submitted response documentation and do a field
41 inspection if necessary.
- 42 i. If work is not acceptable, contact GC to review details and expectations of the repair as
43 needed.
- 44 ii. If work is acceptable close the Warranty Issue.
- 45 2. Quarterly Warranty Reviews:
- 46 a. The GC shall be responsible for scheduling quarterly on-site review with all of the following:
- 47 i. City Project Manager, and other City staff as needed
- 48 ii. Owner and Owner Tenant Representative
- 49 iii. Commissioning Agent (CxA)
- 50 iv. Plumbing, Heating, Electrical Sub-contractors
- 51 v. Other Sub-contractors that may be responsible for open Warranty issues
- 52 b. Quarterly reviews shall be scheduled at 3 months, 6 months, and 11 months after the effective
53 date of the warranty. The review meetings shall:
- 54 i. Review the status of all open Warranty Issues, determine course of action and estimated
55 date of completion.
- 56 ii. In the appropriate quarter, provide shut-down, start-up, testing, and training of off-season
57 equipment as required by the contract documents.

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- iii. The 11th month review shall review all open Warranty Issues, final plan for resolution, and all Warranty Issues where a new letter of warranty may have been issued.

END OF SECTION

**SECTION 01 78 39
AS-BUILT DRAWINGS**

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18

PART 1 – GENERAL

1.1. SUMMARY

- 22 A. This specification is intended to provide clear guidelines and identify the responsibilities of all contractors as they
23 pertain to City of Madison contract procedures regarding the accurate recording of the Work associated with the
24 execution of this contract. This shall include but not be limited to work that will be hidden, concealed, or buried.
25 B. Each contractor shall be responsible for maintaining an accurate record of all installations, locations, and
26 changes to the contract documents during the execution of this contract as it may relate to their specific division
27 or trade.
28 C. The General Contractor (GC) shall be responsible for ensuring all contractors provide as-built record information
29 to the Master As-Built Document Set as described in this specification.
30

1.2. RELATED SPECIFCAITONS

- 32 A. 00 31 21 Survey Information
33 B. 01 26 13 Request for Information
34 C. 01 31 23 Construction Bulletin
35 D. 01 32 33 Photographic Documentation
36 E. 01 26 63 Change Orders
37 F. 01 29 76 Progress Payment Procedures
38 G. 01 31 23 Project Management Web Site (SharePoint)
39 H. 01 33 23 Submittals
40 I. 01 77 00 Closeout Procedures
41 J. 01 91 00 Commissioning
42 K. Other Divisions and Specifications that may address more specifically the requirements for field recording the
43 installation of all items associated with the execution of this contract by Division or Trade.
44

1.3. RELATED DOCUMENTS

- 46 A. Other related documents shall include but not be limited to the following:
47 1. Bidding documents including drawings, specifications, and addenda.
48 2. Required regulatory documents of conditional approval.
49 3. Field orders, verbal or written by inspectors having regulatory jurisdiction.
50 4. Shop drawings and installation drawings.
51

1.4. PERFORMANCE REQUIREMENTS

- 53 A. The GC shall be responsible for maintaining the “Master As-Built Document Set” in the job trailer at all times
54 during the execution of this contract. This document set shall include all of the following:
55 1. Master As-Built Plan Set
56 2. Master As-Built Specification Set
57 3. Other Document Sets

- 1 B. The GC shall designate one person of the GC staff to be responsible for maintaining the Master As-Built
2 Document Set at the job trailer. This shall include, posting updates, revisions, deletions and the monitoring of all
3 contractors posting as-built information as described in this specification.
4 C. All contractors shall use this specification as a general guideline regarding the requirements for documenting
5 their completed Work. Contractors shall explicitly follow additional specification requirements within their own
6 Division of Trade as it may apply to this specification.
7

8 **1.5. QUALITY ASSURANCE**

- 9 A. The GC shall be responsible for all of the following:
10 a. Spot checking all sub-contractors field documents to insure daily information is being recorded as
11 work progresses.
12 b. Discuss as-built recording to the plan set at weekly job meetings with all sub-contractors on site.
13 c. Schedule time with sub-contractors in the job trailer for recording as-built information to the plan
14 set.
15 d. Insure that all sub-contractors are providing clear and accurate information to the plan set in a
16 neat and organized manner.
17 e. Insure sub-contractors who have completed work have finalized recording all as-built information
18 to the plan set before releasing them from the project site.
19 B. The Project Architect, the City Project Manager, Commissioning Agent and other design team staff will perform
20 random checks of the Master As-Built Document Set during the execution of this contract to ensure as-built
21 information is being recorded in a timely fashion as the Work progresses. An updated and current Master As-
22 Built Document Set is a stipulation for approval of the progress payment.
23

24 **PART 2 – PRODUCTS**

25
26 **2.1. OFFICE SUPPLIES**

- 27 A. The GC shall provide a sufficient supply of office products in the job trailer at all times for all contractors to use in
28 recording as-built information into the plan set. This shall include but not be limited to the following:
29 a. Red ink pens, medium point. Pens that bleed through paper, markers, and felt tips will not be
30 accepted.
31 b. The use of highlighters is acceptable. Assign colors to various trades for consistency in recording
32 information.
33 c. Straight edges of various lengths for drawing dimension, extension and other lines.
34 d. Civil and Architectural scales
35 e. Clear transparent, non-yellowing, single sided tape.
36 f. Correction tape or correction fluid for correcting small errors.
37

38 **PART 3 - EXECUTION**

39
40 **3.1. FIELD DOCUMENT AS-BUILTS**

- 41 A. The GC and all Sub-contractors shall be responsible for keeping their own field set of as-built documents
42 including plans, specifications and published changes.
43 B. Field sets shall be kept dry and in good condition at all times.
44 C. No Work shall be buried, covered, or hidden, by any additional Work, regardless of Contractor or Trade, until
45 locations of all materials and equipment has been properly documented as described in section 3.2 below.
46 D. All contractors shall be required to record the following as-built information:
47 a. Notes on the daily installation of materials and equipment.
48 b. Sketches, corrections, and markups indicating final location, positioning, and arrangement of
49 materials and equipment such as pipes, conduits, valves, cleanouts, pull boxes and other such
50 items. Note all final locations on plan sheets, indicate dimension off identifiable building features.
51 Riser diagrams need only be corrected for significant changes in locations, routing or
52 configuration.
53 i. The use of photographs in lieu of hand drawn sketches is acceptable.
54 ii. Photos shall be taken according to Specification 01 32 33 Photographic Documentation
55 iii. Print photo and markup with dimensions or notes as necessary.
56 c. Identify by the use of existing plan symbology and notes the size, type, quantity, and use as
57 applicable of materials such as pipes, valves, conduits, etc.

- 1 d. Note whether horizontal runs are below slab or above ceiling, include dimensions above or below
2 finished floor elevation.
- 3 E. All contractors shall be responsible for transferring the information from their field set of documents to the
4 Master As-Built Plan Set kept in the GC job trailer. See Section 3.3.D. below for the proper procedure.
- 5 F. All contractors shall update the GC Master Plan Set as often as necessary, but not less than once per work week.
- 6

7 **3.2. SITE SURVEY AS-BUILT**

- 8 A. The Land Surveyor Sub-Contractor (PLS) shall provide digital as-built information in the horizontal and vertical
9 datum provided in Specification 01 32 23 Survey and Layout Data.
- 10 B. The PLS shall include but not be limited to including all of the following as part of the site survey as-built:
- 11 1. For underground buried utility laterals and services of all types locate all of the following that may apply:
- 12 a. Connection points at all mains.
- 13 b. Storm discharge points to open air.
- 14 c. All corners and bends regardless of angle, large radius sweeps shall have multiple point locations
15 sufficient to define the sweep.
- 16 d. All vertical drops.
- 17 e. All wells.
- 18 f. Private buried utilities such as buried electrical cables, irrigation systems, etc.
- 19 g. Other information that may need to be located in the future by the owner prior to digging.
- 20 2. Record all surface features including but not limited to the following:
- 21 a. Building corners, pavement edges, and other permanent structural features.
- 22 b. All surface covers for inlets, catch basins, cleanouts, access structures, curb stops and other such
23 devices.
- 24 c. Other permanent surface features such as hydrants, lamp posts, and other permanent site
25 amenities.
- 26 3. The following data shall be recorded while locating items in sub-sections 3.2.a and 3.2.b above:
- 27 a. Flow lines at both ends of pipes
- 28 b. Pipe sizes and material types
- 29 c. Rim elevations for all covers
- 30 d. Sump elevations and invert elevations of all structures
- 31 e. Spot elevations for all pads, driveways, walks, stoops, and floors
- 32 4. Sufficient spot elevations shall be taken to provide a terrain model that will accurately generate contours.
- 33 a. Contours for this contract shall be generated at 1'-0" intervals.
- 34 b. Primary contour intervals shall be every 10'-0"
- 35 c. Except in areas of congestion all contours shall be labeled with text in the required datum
- 36 C. The PLS shall provide the final digital as-built on a thumb drive or CD in Auto CAD 2017, MicroStation V8i, or DXF
37 format to the GC for turn in to the Project Architect and the Civil Engineer.
- 38 D. The Surveyor shall provide two printed as-built site plans to the GC for inclusion in the Master As-Built Plan Set
39 as follows:
- 40 1. 24"x36" sheets as required to show all features (but not contour information) with text neatly organized
41 for each item identified. When multiple sheets are used a match line and sheet references shall be
42 required.
- 43 2. 24"x36" sheets as required showing contours, contour labels, and features from item 1 above, but with
44 no additional text. When multiple sheets are used a match line and sheet references shall be required.
- 45

46 **3.3. MASTER AS-BUILT DOCUMENT SET**

- 47 A. The GC shall be responsible for maintaining the Master As-Built Document Set in the job trailer at all times.
- 48 1. The Master As-Built Plan Set (Plan Set) shall begin with one complete bid set of drawings and any
49 additional sheets that were supplied by published addenda during the bidding process. The cover sheet
50 shall be titled as the "Master As-Built Plan Set" in large bold red letters approximately 2" in height and
51 shall not be used for any other purpose.
- 52 a. The Plan Set shall be kept dry, legible, and in good condition at all times.
- 53 b. The Plan Set shall be kept up to date with new revisions within two (2) working days of
54 supplemental drawings being issued. Revisions shall be posted as follows:
- 55 i. Insert new, revised sheets into the plan set. Void old sheets but do not remove them from
56 the plan set. Indicate date received and what document (RFI, CB, CO, etc.) caused the
57 change.

- 1 ii. Insert new, revised individual details into the plan set. Void old details, tape new details
2 over the old details with a “tape hinge” to allow them to be viewed. Indicate date
3 received and what document (RFI, CB, CO, etc.) caused the change.
- 4 iii. Add new details in appropriate white space on relevant sheets. If no space is available use
5 the back side of the previous sheet or insert a new sheet. Indicate date received and what
6 document (RFI, CB, CO, etc.) caused the change.
- 7 c. The Plan Set shall be available at anytime for easy reference during progress meetings and for
8 emergency location information of new work already completed.
- 9 2. The Master As-Built Specification Set (Spec Set) shall begin with one complete bid set of specifications
10 and any additional specifications that were supplied by published addenda during the bidding process.
11 The Spec Set shall be provided in three “D” ring type binders of sufficient thickness to accommodate the
12 specification set. Multiple binders are allowed as necessary. Label the front cover and binding edge with
13 “Master As-Built Specifications” in bold red letters. Provide other information as necessary to distinguish
14 the contents of multi-volume sets.
 - 15 a. The Spec Set shall be kept dry, legible, and in good condition at all times.
 - 16 b. The Spec Set shall be kept up to date with new revisions within two (2) working days of
17 supplemental drawings being issued.
 - 18 c. The Spec Set shall be available at anytime for easy reference during progress meetings.
- 19 3. Other Document Sets may be kept at the GCs option in three “D” ring type binders of sufficient thickness
20 to accommodate the documentation. Other documentation sets may include but not be limited to RFIs,
21 CBs, COs, etc.
- 22 C. The Land Surveyor Sub-Contractor shall be required to use digital surveying for all exterior site surveying, and
23 provide deliverable digital as-builts as specified in Specification 00 31 21 Survey Information. As soon as practical
24 the surveyor shall provide the GC with a preliminary copy of installed buried utilities for inclusion with the plan
25 set in the job trailer. The surveyor shall provide final digital as-builts as per section 3.2 above.
- 26 D. All contractors shall be responsible for updating the Plan Set from their field sets at least once per work week.
27 Updates shall include but not be limited to the following procedures:
 - 28 a. All updates shall be done only in red ink. Place a “cloud” around small areas of correction to call
29 attention to the change.
 - 30 b. Whenever possible place general work notes, field sketches, supplemental details, photos, and
31 other such information on the reverse side of the preceding sheet. Installation notes including
32 dates shall be kept neatly organized in chronological order as necessary.
 - 33 c. Accurately locate items on the plan set as follows:
 - 34 i. For items that are located as dimensioned provide a check mark or circle indicating the
35 dimension was verified.
 - 36 ii. For items that are within 5 feet of the location indicated on the plans leave as shown and:
 - 37 • Provide correct dimensions to existing dimension strings or,
 - 38 • Accurately locate with new dimension strings
 - 39 iii. For items that are more than 5 feet from the location indicated on the plans
 - 40 • Accurately draw the items in the new location as installed and,
 - 41 • Accurately locate with new dimension strings and,
 - 42 • Note that the existing location is void.
 - 43 d. Include dimensioned locations for items that will be buried, concealed, or hidden in the ground,
44 under floors, in walls or above ceilings.
 - 45 i. Dimensions shall be pulled from identifiable building features, not from centers of columns
46 or other buried features.
 - 47 ii. When necessary pull more dimensions as needed from opposing directions to properly
48 locate single items.

3.4. AS-BUILT REVIEW AND ACCEPTANCE

- 51 A. The GC shall provide the Master As-Built Plan Set to the Project Architect (PA), the City Project Manager (CPM),
52 the Commissioning Agent (CxA) and other design team staff for content review prior to the Progress Payment
53 Milestone indicated in Specification 01 29 76 Progress Payment Procedures. The submitted plan set shall include
54 the digital survey information produced under Section 3.2 above.
 - 55 1. If the plan set is not approved:
 - 56 a. The PA and CPM shall only be required to generalize deficiencies by trade there shall be no
57 requirement or expectation to generate a “punch list” of required corrections.

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- b. The GC and Sub-contractors as necessary shall be responsible for inspecting the installation and correcting the drawings as needed.
 - c. The GC shall re-submit the plan set for review.
2. If the plan set is approved the PA shall take possession of the plan set to be used in providing the owner with digital CAD record drawings. Upon completion of transferring the information to CAD the PA shall provide the Owner with CAD record drawings, record PDFs, and the Master As-Built Plan Set.

8 **3.5. CHANGES AFTER ACCEPTANCE**

- 9 A. No Contractor shall be responsible for making changes to the As-Built record documents after acceptance by the
- 10 PA and CPM except when necessitated by changes resulting from any Work made by the Contractor as part of
- 11 his/her guarantee.
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**SECTION 01 78 43
SPARE PARTS AND EXTRA MATERIALS**

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13 3.2. PACKAGING 2
14 3.3. LABELING 2
15 3.4. INVENTORY 2
16 3.5. STORAGE 3
17 3.6. CLOSEOUT PROCEDURE 3
18

PART 1 – GENERAL

1.1. SUMMARY

- 22 A. This specification is intended to provide clear guidelines and identify the responsibilities of all contractors as they
23 pertain to City of Madison contract procedures regarding spare parts, special tools, special materials, and extra
24 materials.
25 B. Each contractor shall be responsible for knowing the specific requirements of their Division Specifications as they
26 may relate to the general information provided in this specification.
27 C. The General Contractor (GC) shall be responsible for ensuring all contractors provide spare parts and extra
28 materials as described in this specification.
29

1.2. RELATED SPECIFICAITONS

- 31 A. 01 29 76 Progress Payment Procedures
32 B. 01 31 23 Project Management Web Site (SharePoint)
33 C. 01 77 00 Closeout Procedures
34 D. Other Divisions and Specifications that may address more specifically how to proceed with spare parts, special
35 tools, special materials, and extra materials.
36

1.3. DEFINITIONS

- 38 A. Spare Parts: Any component of a product or assembly that comes pre-packaged or was specially ordered for the
39 explicit use of the product or assembly. This shall include but not be limited to fastening devices, mounting
40 brackets, replacement parts, wheels, pulleys, wiring, alternate assembly pieces, etc.
41 B. Special Tools: Any tool of any kind that was pre-packaged or specially ordered, and is required to be used for the
42 installation or maintenance of an installed product or assembly as part of this contract.
43 C. Special Materials: Any oil, lubricant, glue, touch-up paint, or other such material that comes pre-packaged or
44 was specially ordered and is required to be used for the installation or maintenance of an installed product or
45 assembly as part of this contract.
46 D. Extra Materials (Attic Stock): Any surplus materials in new and useable condition that was installed a part of this
47 contract. Attic Stock shall include but not be limited to the following: ceiling tiles, paint, stain, floor coverings,
48 ceramic tiles, light bulbs/lamps, filters, strainers, etc. Attic Stock shall include partially opened bulk items and
49 additional unopened quantities as directed by other specifications.
50

1.4. PERFORMANCE REQUIREMENTS

- 52 A. All contractors shall be responsible for consolidating spare parts, special tools, special materials, and attic stock
53 as it pertains to the specific Work within their Division or Trade.
54 B. All contractors shall use this specification as a general guideline regarding the requirements for turning spare
55 parts, special tools, special materials, and attic stock over to the owner. Contractors shall explicitly follow
56 specification requirements within their own Division of Trade.
57

1 **1.5. QUALITY ASSURANCE**

- 2 A. The General Contractor (GC) shall be responsible for all of the following:
- 3 1. Coordinate the location for and the delivery of all spare parts, special tools, special materials, and attic
4 stock being provided by all contractors under this contract to one centralized location as designated by
5 the Owner.
- 6 2. Verify that all items being delivered are:
- 7 a. Clean, new, and in a usable condition.
- 8 b. Properly sealed, protected, and labeled
- 9 c. Properly documented

10
11 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

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13 **PART 3 - EXECUTION**

14
15 **3.1. GENERAL REQUIREMENTS**

- 16 A. A. All contractors shall be responsible for reviewing the drawings and specifications within their Divisions of
17 Work to provide a complete and comprehensive list of all spare parts, extra material, and tool requirements to
18 the GC.
- 19 B. The GC shall be responsible for all of the following:
- 20 1. Consolidating all of the sub-contractor lists into one master Checklist.
- 21 a. The checklist shall be in a tabular data format similar to the sample below.
- 22

<u>Title</u>	<u>Specification</u>	<u>Item</u>	<u>Specified Quantity</u>	<u>Provided Quantity</u>
AHU-1	23 73 13	Filters Fan belts	1-year supply (12 filters) 1 each size	
CPT-1	09 68 13	2x2 carpet tile	2% unopened	

- 23
24 2. Upload the completed checklist to the Submittal Library on the Project Management Web Site
25 (SharePoint) for review. See Specification 01 33 23 Submittals for more information on this procedure.
- 26 3. Resubmit the schedule as needed after initial reviews have been completed.
- 27

28 **3.2. PACKAGING**

- 29 A. Whenever possible all surplus items should remain in their original packaging such as parts envelopes.
- 30 B. Package small parts in re-sealable plastic bags (Ziploc) or envelopes with clasp fasteners. Do not use envelopes
31 that seal with glue or tape envelopes closed. Do not leave packaging unsealed.
- 32 C. Package like parts together for products or assemblies. I.E. keep all spare parts for flushometers together.
- 33 D. Many small packages may be grouped together into a larger container by trade.
- 34 E. Do not use unrelated boxes or containers for packaging spare items. I.E. do not use a light fixture box for spare
35 breakers, or flushometers parts.

36
37 **3.3. LABELING**

- 38 A. Whenever possible the original labeling indicating part numbers and other pertinent information shall remain on
39 the original packaging.
- 40 B. If original labeling is not available the contractor shall label all parts and packages using tape or labels and
41 permanent black markers. Tape or labels being used shall absorb the permanent marker without bleeding or
42 allowing ink to be smeared or rubbed off.
- 43 C. Labels shall include the name of the product or equipment the item belongs to, part number and/or name, and
44 any other information that would assist maintenance personnel in identifying the piece and related product.
- 45 D. Labels shall include plan or specification designations (WC-1, LAV-3, DF-2, CPT-1, etc.) that identify the particular
46 product or finish material it represents.
- 47 E. Labels for parts stored in clear re-sealable plastic bags may be placed inside the bag. Label shall face out and be
48 able to be read from one side. Multiple bags shall be numbered individually for identification.
- 49 F. Label the outside of large containers with the trade name (Plumbing, Electrical, etc.).

50
51 **3.4. INVENTORY**

- 52 A. All contractors shall provide the GC with complete inventories of all spare parts, special tools, special materials,
53 and attic stock that they are providing at the end of the contract. The inventories shall be organized as follows:

- 1 1. The cover sheet shall indicate the Contractors name, address, phone number, identify that the document
2 is the "Spare Parts and Extra Materials Inventory", and identify the Division or Trade the inventory is for.
3 2. Provide an inventory in a tabular format of all items being provided under this and other specifications.
4 The minimum information to be provided for each item on the inventory shall be as follows:
5 a. Bag or container number, all items of one bag or container shall be grouped together on the
6 inventory
7 b. Item description
8 c. Item size (if applicable)
9 d. Total quantity provided
10 e. Identify if item is a spare part, tool, special material, or attic stock
11 B. The GC shall consolidate inventories from all sub-contractors into one tabular data sheet organized by Division or
12 Trade of Work.
13 1. Upon completing the consolidated list the GC shall upload the completed inventory to the Contract
14 Closeout-Attic Stock Library on the Project Management Web Site.
15 2. The GC shall notify the Project Architect and City Project Manager that the scans have been uploaded.
16 3. Consulting Staff and Owner Staff shall review the inventories prior to Final Review to verify that minimum
17 required quantities have been met. Deficiencies shall be noted and returned back to the GC for
18 corrective action.

19
20 **3.5. STORAGE**

- 21 A. Prior to the 80% Progress Payment milestone the GC shall coordinate with the City Project Manager and
22 Maintenance Personnel where spare parts, special tools, special materials, and attic stock shall be stored.
23 B. The GC shall instruct all contractors as to the location and proper storage procedures.
24 C. The GC shall be responsible for ensuring the storage area is kept neat and orderly as follows:
25 1. Like items are stored together by material, product, or trade as necessary.
26 2. Liquids are stored in sealable containers and the lids have been properly installed to prevent drying out,
27 spillage, etc.
28 3. All labels are clearly visible and provide the required information.
29 D. Large items shall be stored so as not to damage other items. Do not stack heavy items or items with distinct
30 shapes/outlines on softer items that may get crushed or imprinted.

31
32 **3.6. CLOSEOUT PROCEDURE**

- 33 A. Prior to the 90% Progress Payment milestone the GC shall review all attic stock already stored by the contractors
34 to ensure the following:
35 1. Materials are stored in the proper location(s).
36 2. All boxes, containers and items are properly labeled according to the submitted/approved inventory.
37 3. Quantities are correct according to the submitted/approved inventory.
38 B. The GC shall ensure that all deficiencies are corrected prior to conducting Demonstration and Training Sessions.
39 C. The GC shall review with Maintenance Staff all inventories and labeling during the scheduled Demonstration and
40 Training Sessions.
41 D. Any discrepancies associated with Attic Stock shall be resolved and verified prior to the CPM releasing the 90%
42 CT progress payment.

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46 **END OF SECTION**
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**SECTION 01 79 00
DEMONSTRATION AND TRAINING**

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PART 1 – GENERAL

1.1. SUMMARY

- 19
20 A. The purpose of this specification is to provide clear responsibilities and guidelines related to providing
21 Demonstration and Training (D&T) Sessions related to general facility use, equipment, systems, finishes, and
22 materials to City of Madison Staff (Owner, Owner Representatives, Maintenance, and Custodial Personnel) as
23 needed.
24 B. All D&T shall be coordinated through the General Contractor (GC), Project Architect (PA) and City Project
25 Manager (CPM), and will be based on or customized to the needs of City of Madison Staff being trained. New
26 equipment and systems may have complete D&T sessions as described in this specification while equipment or
27 systems staff is familiar with may have sessions more focused on maintenance only.
28

1.2. RELATED SPECIFICATIONS

- 29
30 A. Section 01 29 76 Progress Payment Procedures
31 B. Section 01 31 23 Project Management Website (SharePoint)
32 C. Section 01 78 13 Completion and Correction List
33 D. Section 01 78 19 Maintenance Contracts
34 E. Section 01 78 23 Operation and Maintenance Data
35 F. Section 01 78 36 Warranties
36 G. Section 01 78 39 As-Built Drawings
37 H. Section 01 78 43 Spare Parts and Extra Materials
38 I. Section 01 91 00 Commissioning
39 J. Other Divisions and Specifications that may address more specifically the requirements for D&T sessions related
40 to the installation of all items and equipment installed under the execution of the Work.
41

1.3. QUALITY ASSURANCE

- 42
43 A. All contractors shall have the responsibility of preparing for and conducting D&T sessions as determined by this
44 and other Division or Trade related specifications, Owner Operation and Maintenance Manuals, Use and Care
45 Manuals and other such documentation related to the Work.
46 B. The GC shall have responsibility for:
47 1. Ensuring that all contractors required to conduct a D&T session have successfully completed all of the
48 following:
49 a. Turned in all required documentation for review and documentation has been approved/accepted
50 prior to scheduling D&T sessions.
51 b. Other required documentation as needed is available and ready for use during the D&T session.
52 c. All systems have been started, tested, and running as per appropriate specification and/or
53 manufacturers recommendations prior to scheduling D&T sessions.
54 d. All contractors are sufficiently prepared for their D&T session
55 e. Documents the D&T session including date, time, contractor and company name, attendees and
56 other information regarding the session

2. Organizing the coordination and scheduling of all D&T sessions between all contractors and the appropriate representatives of the Owner. These representatives may include any of the following depending on the Work of the Contract:
 - a. Owner – end users
 - b. Facility Maintenance personnel
 - i. Facility general operation procedures including custodial services
 - ii. Electrical
 - iii. Mechanical
 - iv. Plumbing
 - v. Site
 - c. Information Technology (IT) Department
 - d. Traffic Engineering – Radio Shop
 - e. Architects, Engineers and Facility Management staff as project completion overview

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL REQUIREMENTS

- A. All contractors shall be responsible for reviewing the drawings and specifications within their Divisions of Work to provide a complete and comprehensive list of all D&T requirements to the GC.
- B. The GC shall be responsible for all of the following:
 1. Consolidating all of the D&T lists into one master D&T Checklist.
 - a. The checklist shall be in a tabular data format similar to the sample below.

<u>Title</u>	<u>Specification</u>	<u>Training</u>	<u>Plan Completed</u>	<u>Training Completed</u>
AHU-1	23 73 13	General Operation; Maintenance		
Overhead Door	12 93 00	General Operation; Maintenance		

2. Upload the completed checklist to the Submittal Library on the Project Management Web Site (SharePoint) for review. See Specification 01 33 23 Submittals for more information on this procedure.
3. Resubmit the schedule as needed after initial reviews have been completed.
- C. The GC shall develop a specific D&T plan to be scheduled and conducted as described below but no sooner than the meeting discussed in 3.2.A.2 below.
- D. The GC shall not schedule D&T sessions to preclude required personnel from attending multiple sessions.

3.2. COORDINATING AND SCHEDULING THE TRAINING

- A. The GC, PA, CxA and CPM, shall review all Training and Demonstration requirements during two (2) special meetings.
 1. The first meeting shall be held at the 50% Contract Total Payment. During this meeting the following shall be discussed:
 - a. Preliminary schedule of training dates to be completed prior to beginning construction closeout.
 - b. List of documentation and items that need to be completed and available before and during the training session.
 - c. Who (Owner, Maintenance, etc.) will be attending what training session(s).
 2. The second meeting shall be held at the 80% Contract Total Payment. This meeting shall review due outs that have not yet been completed for the 90% Contract Total Payment and the requirements necessary for Construction Closeout. All Demonstration and Training sessions shall be completed prior to receiving the 90% progress payment and beginning Construction Closeout Procedures (see Specification 01 77 00).
 - a. This does not include any requirement associated with off season equipment preparation and/or demonstration and Training Sessions.
- B. All of the Construction Work shall be operationally ready prior to conducting training as follows:
 1. All contractors shall have their As-Built Drawing Records available for reviewing locations of system components during training.
 2. All final and approved Operations and Maintenance Data shall be completed no less than two (2) full weeks prior to the scheduled training.

- 1 3. All systems shall have been started, functionally tested, balanced, and fully operational, and all piping
2 and equipment labeling complete at least two (2) days prior to the scheduled training.
3 a. Seasonal equipment shall not be trained out of season. Contractors having seasonal equipment
4 shall work with the GC and CPM for coordinating additional training sessions as appropriate for
5 seasonal equipment.
6 C. Correction list items that prevent a piece of equipment or system from being fully operational for training shall
7 be corrected prior to conducting the training.
8

9 **3.3. TRAINING OBJECTIVES**

- 10 A. For each piece of equipment or system installed train on the following objectives/topics as applicable:
11 1. System design, concept, and capabilities
12 2. Review of related contractor as-built drawings
13 3. Facility walkthrough to identify key components of the system
14 4. System operation and programming including weekly, monthly, annual test procedures
15 5. System maintenance requirements
16 6. System troubleshooting procedures
17 7. Testing, inspection, and reporting requirements associated with any regulatory requirements
18 8. Identification of any correction list items still outstanding
19 9. Review of system documentation including the following:
20 a. Operation and maintenance data
21 b. Warranties
22 c. Valve charts, tags, and pipe identification markers
23 B. For each piece of specialty equipment train on the following objectives/topics as applicable:
24 1. Manufacturers operations instructions
25 2. Manufacturers use and care instructions
26 3. Manufacturers maintenance and troubleshooting instructions
27 4. System operation and programming including weekly, monthly, annual test procedures
28 5. Identification of any correction list items still outstanding
29 6. Review of system documentation including the following:
30 a. Operation and maintenance data
31 b. Warranties
32 C. End User Orientation
33 1. Facility walkthrough
34 2. Security and emergency features
35 3. General facility operation procedures
36 D. Facility General Use and Custodial Services – if requested
37 1. Facility walkthrough
38 2. Security and emergency features
39 3. General facility operation procedures
40 4. Care and maintenance of specialty items, finishes, etc. as requested
41 5. Attic stock inventory and material designations
42

43 **3.4. DEMONSTRATION AND TRAINING PROGRAM PREPARATION**

- 44 A. Each contractor having a responsibility for providing D&T sessions shall meet with the GC, CPM, and other City
45 Staff as needed to review the extent of the Training Objectives in section 3.3 above needed for each piece of
46 equipment, system, finish, etc. This meeting shall occur no less than four (4) weeks prior to the anticipated
47 training session.
48 B. The contractor shall use the information from item 3.4.A above to prepare a formal training program for each
49 piece of equipment or system based on the Training Objectives in 3.3 above.
50 1. The formal training program shall include the following information:
51 a. Session title
52 b. List of systems, equipment, use, care, etc. to be covered during the session
53 c. Provide the following for each systems, equipment, use, care, etc. to be covered during the
54 session
55 i. Name and affiliation of each instructor to be used. As needed and discretion of the Owner
56 the GC to require attendance by the installing technician, installing Contractor and the
57 appropriate trade or manufacturer’s representative.

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- ii. Qualifications of each instructor to be used. Practical building operation expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment as installed in this project is required by the training personnel. If Owner determines training was not adequate, the training shall be repeated until acceptable to Owner.
 - iii. A checklist of all documentation and system/equipment requirements necessary to complete a successful training session and the current status of each
 - iv. Any additional documents, training aids, video or other items to be used to complete the training
 - v. Any special requirements or needs associated with item iv above to complete the training
 - d. The intended audience for the training
 - e. The approximate duration of each objective or topic to be covered
2. Submit the completed training program to the GC for review and approval by the PA and CPM.
- C. The PA and CPM shall work with staff as necessary to ensure all points of anticipated training needs have been met. The PA and CPM will approve the program as submitted or recommend changes for re-submittal as necessary.

3.5. CONDUCTING A DEMONSTRATION AND TRAINING SESSION

- A. All contractors shall conduct their required D&T Sessions as follows:
1. Begin with a classroom session
 - a. Provide a sign in sheet indicating all training to be conducted, instructors, etc.
 - b. Provide an overview of the training to be conducted including the approximate schedule.
 2. Conduct a general walk-through of the site.
 - a. Point out locations of various equipment, valves, charts, and other related items.
 - b. Use the Division or Trade As-Built record drawings to indicate locations of hidden or buried items.
 3. Provide a demonstration of general equipment/system operation including using the O&M manual.
 - a. Startup and shutdown procedures.
 - b. Normal operational levels as depicted by any gauges, software, etc.
 - c. Indicate warning devices, signs etc. and demonstrate emergency shut-down procedures.
 4. Provide a demonstration of all owner level maintenance using the O&M manual.
 - a. Indicate frequency of maintenance.
 - b. Provide and review all spare parts, special tools, and special materials.
 5. Provide and review all spare parts, special tools, special materials, or attic stock as applicable.
 6. While conducting D&T sessions:
 - a. Allow hands on training whenever practical.
 - b. Answer questions promptly
 - c. Repeat demonstrations and procedures as necessary.
- B. Within two (2) working days of completing the D&T session the contractor responsible for the session shall turn-in any documentation generated including the sign in roster to the GC.
- C. The GC shall turn over all training documentation to the PA and CPM upon completion of D&T sessions.
- D. Re-schedule any training that has been determined to be inadequate or inappropriate for any reason including but not limited to any of the following;
1. Unqualified instructor
 2. System installation incomplete or untested to the specifications
 3. Equipment failure during demonstration
 4. Un-expected cancellation

3.6. CLOSEOUT PROCEDURE

- A. Prior to receiving the 90% Progress payment the GC shall:
1. Verify with the PA and CPM that each Demonstration and Training Session was conducted properly and according to the submitted plan.
 2. Any required "Off Season" equipment testing, balancing, and Demonstration and Training Sessions have been tentatively scheduled with the GC, necessary sub-contractors, instructors and Owner/Owner Representatives as necessary.

END OF SECTION

SECTION 01 81 13
SUSTAINABLE DESIGN REQUIREMENTS

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29
30 **PART 1 – GENERAL**
31
32 **1.1 RELATED DOCUMENTS**
33 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
34 B. Comply with Wisconsin Commercial Building Codes/International Building Code (IBC).
35 C. Comply with Americans with Disabilities Architectural Guidelines, and ICC/ANSI A117.1-Latest Edition.
36 D. Comply with USGBC LEED prerequisites and credits needed for Project to obtain “LEED Gold certification based on USGBC’s LEED 2009 for New Construction and
37 Major Renovations”.
38
39 **1.2 SUMMARY**
40 A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain “LEED Gold
41 certification based on USGBC’s LEED-NC (New Construction and Major Renovations)” Version 3.0.
42 1. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED
43 requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution
44 requests and comparable product requests.
45 2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that
46 are not part of the Work of the Contract.
47 3. A copy of the LEED Project checklist is attached at the end of this Section for information only.
48 4. Specific requirements for LEED are included in greater detail in other Sections.
49 B. Related Sections: Divisions 01 through 32 Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include
50 reference to LEED.
51
52 **1.3 PREINSTALLATION MEETINGS**
53 A. Preinstallation Conference: Conduct conference at Project site.
54
55 **1.4 DEFINITIONS**
56 A. Albedo (a.k.a. solar reflectance): The ratio of the reflected electromagnetic energy to the incoming electromagnetic energy.
57 B. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-
58 accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that
59 manufacturer is certified for chain of custody by an FSC-accredited certification body.
60 C. Emissivity (a.k.a. infrared emittance): A parameter between 0 and 1 that indicates the ability of a material to shed infrared radiation.
61 D. LEED: Leadership in Energy and Environmental Design. Green Building Rating System representing the US Green Building Council’s effort to provide a national
62 standard for what constitutes a “green building”. The standard requires quantitative and technical documentation to demonstrate compliance with goals
63 described in the US Green Building Council’s Green Building Rating System, Version 3.0.
64 E. Hydrofluorocarbons (HFCs): Refrigerants used in building equipment that do not deplete the stratospheric ozone layer.
65 F. Locally-Manufactured (for LEED™ Materials Credit 5): Refers to the final assembly of components into the building product that is furnished and installed by the
66 trades people. For example, if the hardware comes from Seoul, South Korea, the lumber from Vancouver, British Columbia, and the joist is assembled in Kent
67 Washington, then the location of the final assembly is Kent, Washington.
68 G. Post-Consumer Recycled Content: The percentage of waste material by weight available from consumer use incorporated into a building material.
69 H. Pre-consumer (aka Post-Industrial Recycled) Content: The percentage of waste material by weight available from industrial use incorporated into a building
70 material. Post-industrial recyclable materials are different from industrial scrap, a by-product of industrial processes that can easily be reused as a feedstock.
71 I. Potable Water: Water that is suitable for drinking and is supplied from wells or municipal water systems.
72 J. Recycling: The collection, reprocessing, marketing and use of materials that were recovered or diverted from the solid waste stream. Note that LEED uses the
73 term "pre-consumer" rather than "post-industrial." Also note that when manufacturers and trade associations use the term "post- industrial" it often includes
74 spills, scraps, and damaged and surplus materials that are fed back into the same manufacturing process and that these materials are not considered recycled
75 content by the LEED rating systems.
76 K. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by
77 the cost of assembly to determine the recycled content value.
78 L. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users
79 of the product, which can no longer be used for its intended purpose.
80 M. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as
81 rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.
82 N. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If only a fraction of a
83 product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
84 O. Regionally Manufactured Materials: Materials that are manufactured within a radius of 500 miles from Project site. Manufacturing refers to the final assembly of
85 components into the building product that is installed at Project site.
86 P. Regionally Extracted and Manufactured Materials: Regionally manufactured materials made from raw materials that are extracted, harvested, or recovered within
87 a radius of 500 miles from Project site.
88 Q. Solar Reflectance: See “Albedo.”
89 R. Sustainable Forestry: The practice of managing forest resources to meet the long-term product needs of humans while maintaining the biodiversity of forested
90 landscapes. The primary goal is to restore, enhance, and sustain a full range of forest values, both economic and ecological.
91 S. Type A Finishes: Material and finishes with potential for short-term levels of off gassing from chemicals inherent in their manufacturing process, or which are
92 applied in form requiring vehicles or carriers for spreading which release high level of particulate matter in process of installation and/or curing. Including, but not
93 limited to:
94 1. Composite wood products, specifically including particleboard from which millwork, wood paneling, doors, or furniture may be fabricated.
95 2. Adhesives, sealants, and glazing compounds, specifically those with petrochemical vehicles or carriers.
96 3. Wood preservatives, finishes, and paint.
97 4. Control and/or expansion joint-fillers.
98 5. Hard finishes requiring adhesive installation.

- 1 6. Gypsum board and associated finish processes.
- 2 T. Type B Finishes: Fuzzy material and finishes which are woven, fibrous, or porous in nature and tend to adsorb chemicals off-gassed by Type A finishes or may be
- 3 adversely affected by particulates. These materials become "sink" for deleterious substances which may be released much later, or collectors of contaminants
- 4 that may promote subsequent bacterial growth. Including, but not limited to:
- 5 1. Carpeting and padding.
- 6 2. Fabric wallcovering.
- 7 3. Insulation exposed to air stream.
- 8 4. Acoustic ceiling materials.
- 9 5. Fabric covered acoustic wall panels.
- 10 6. Upholstered furnishings.
- 11 7. Materials that can be categorized as both Type A and Type B.
- 12 U. Ventilation: The process of supplying and removing air to and from interior spaces by natural or mechanical means.
- 13 V. Volatile organic compounds (VOCs): Chemical compounds based on carbon and hydrogen structures that are vaporized at room temperatures. VOCs are one type
- 14 of indoor air contaminant.
- 15 W. Waste Materials: Large and small pieces of materials indicated which are excess to contract requirements and generally include materials salvaged from existing
- 16 construction and items of trimmings, cuttings, and damaged goods resulting from new installations which cannot be effectively used in Work.
- 17 X. LEED Project Administrator: LEED Certified Professional hired by the project owner to review LEED submittals.
- 18
- 19 **1.5 ADMINISTRATIVE REQUIREMENTS**
- 20 A. Respond to questions and requests from Architect and the USGBC regarding LEED credits that are the responsibility of the Contractor, that depend on product
- 21 selection or product qualities, or that depend on Contractor's procedures until the USGBC has made its determination on the project's LEED certification
- 22 application. Document responses as informational submittals.
- 23
- 24 **1.6 ACTION SUBMITTALS**
- 25 A. General: Submit additional LEED submittals required by other Specification Sections.
- 26 B. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as
- 27 a separate submittal to verify compliance with indicated LEED requirements.
- 28 C. LEED Submittals: Submit LEED related information under a separate Tab within each product submittal. The LEED submittal shall include:
- 29 1. Summary Sheet: A summary, on General Contractors letterhead, of all LEED information requested in specifications shall include:
- 30 a. Olbrich Botanical Gardens Expansion Project 1.
- 31 b. LEED Submittal List: A list of all materials being submitted. For products composed of multiple materials the submittal shall include a list of all
- 32 materials composing the product.
- 33 c. For Products in Divisions 2 - 10, include the following information:
- 34 i. Material costs, for each material on the LEED submittal list, excluding labor costs, delivery cost, cost of installation, as well as profit and
- 35 overhead.
- 36 ii. The pre-consumer and post-consumer recycled content of each material on the LEED submittal list.
- 37 iii. List of all material manufacturing locations.
- 38 iv. Provide distance between manufacturing and construction site.
- 39 d. All other LEED information required in specification.
- 40 2. Manufacturer's literature with information highlighted that confirm the figures used in the summary report.
- 41 a. If a range is used in the manufacturer's literature, the summary report shall use the lowest number in the range.
- 42 b. For VOC Submissions: Submit MSDS sheets or manufacturer's literature with VOC figure highlighted.
- 43 D. Project Material Costs Data: Provide a statement, on Contractor's letterhead, documenting the total material for the project. Include a spreadsheet tallying the
- 44 material cost for all materials specified in Divisions 2 - 32. The total in the material cost data will be used in the LEED Online template to be completed by the
- 45 Contractor as the actual material cost of the project.
- 46 E. LEED Action Plan: Provide preliminary submittal within 30 days of Notice to Proceed that contains:
- 47 1. Example spreadsheets for each construction credit identified in this section.
- 48 2. Contact information for Contractor's LEED coordinators.
- 49 3. Brief description of how the following requirements will be met.
- 50 a. Credit SS Prerequisite 1: Construction Activities Pollution Prevention complying with Section 31 25 00, Erosion Control.
- 51 b. Credit MR c2: Construction Waste Management complying with Section 01 74 19 Construction Waste Management and Disposal. Include a sample
- 52 spreadsheet showing how the tipping information is going to be recorded to comply with LEED requirements.
- 53 c. Credit MR c4: Recycled content information including methods of collection and recording.
- 54 d. Credit MR c5: Manufacturing location information including methods of collection and recording.
- 55 e. EQ c4.1 - 4.4: VOC information including methods of collection and recording required LEED information.
- 56 4. After CPM approval of the Preliminary Action Plan the Contractor shall update the plan monthly with LEED information collected to date and be submitted
- 57 as part of a monthly progress report.
- 58 F. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing the actual construction and purchasing activities with LEED
- 59 requirements for the following:
- 60 1. Credit SS Prerequisite 1: Construction Activities Pollution Prevention.
- 61 2. Credit MR c2: Construction Waste Management.
- 62 3. Credit MR c4: Recycled content for materials specified in Divisions 2 - 32.
- 63 4. Credit MR c5 Regional Materials: Distance to manufacturing for materials specified in Divisions 2 - 32.
- 64 5. IEQ c4.1 - 4.4: VOC information.
- 65 G. LEED Documentation Online Submittals: The Contractor shall be responsible for completing the following LEED submissions using the LEED online tool for credit
- 66 submission to USGBC. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory for USGBC submission.
- 67 1. Credit EA 5: Product data and wiring diagrams for sensors and data collection system used to provide continuous metering of building energy-consumption
- 68 performance over a period of time of not less than one year of post-construction occupancy.
- 69 2. Credit MR 2: Comply with Division 1 Section "Construction Waste Management and Disposal."
- 70 3. Credit MR 4: Product data and certification letter from product manufacturers indicating percentages by weight of post-consumer and pre-consumer
- 71 recycled content for products having recycled content. Include statement indicating material costs for each product having recycled content.
- 72 4. Credit MR 5: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or
- 73 recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
- 74 5. Credit IEQ 3.1:
- 75 1. Construction indoor-air-quality management plan.
- 76 2. Product data for temporary filtration media.
- 77 3. Product data for filtration media used during occupancy.
- 78 4. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the
- 79 SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-
- 80 site stored or installed absorptive materials.
- 81 6. Credit IEQ 3.2: Construction IAQ Plan: Before Occupancy.
- 82 1. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that
- 83 filtration media was replaced after flush-out.
- 84 2. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-
- 85 quality testing procedures and requirements.
- 86 7. Credit IEQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC
- 87 content in g/L calculated according to 40 CFR 59, Subject D (EPA Method 24).
- 88 8. Credit IEQ 4.2: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC
- 89 content in g/L calculated according to 40 CFR 59, Subject D (EPA Method 24).
- 90 9. Credit IEQ 4.4: Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-
- 91 formaldehyde resin.
- 92
- 93 **1.7 INFORMATIONAL SUBMITTALS**
- 94 A. Qualification Data: For LEED coordinator.
- 95 B. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of
- 96 costs for the following categories of items:
- 97 1. Furniture.
- 98 2. Plumbing.

- 1 3. Mechanical.
- 2 4. Electrical.
- 3 5. Specialty items such as elevators and equipment.
- 4 6. Wood-based construction materials.
- 5 C. LEED Action Plans: Provide preliminary submittals within 30 days of date established for the Notice of Award indicating how the following requirements will be met:
- 6
- 7 1. Credit MR 2: Waste management plan complying with Section 01 74 19 "Construction Waste Management and Disposal."
- 8 2. Credit MR 4: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
- 9
- 10 3. Credit MR 5: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
- 11
- 12 4. Credit IEQ 3.1: Construction indoor-air-quality management plan.
- 13 D. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:
- 14
- 15 1. Credit MR 2: Waste reduction progress reports complying with Section 01 74 19 "Construction Waste Management and Disposal."
- 16 2. Credit MR 4: Recycled content.
- 17 3. Credit MR 5: Regional materials.
- 18

1.8 QUALITY ASSURANCE

- 19 A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.
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- 21
- 22

1.9 CONTRACTOR RESPONSIBILITIES

- 23 A. This project has been registered with USGBC. The Contractor shall provide all necessary documentation for LEED v3.0 certification in accordance with the specifications. Format and content of all construction documentation must be in accordance with the LEED Reference Guide requirements for supporting data required in event of USGBC audit of the particular credit. Contractor is required to coordinate all requirements to assure assembled data is acceptable to USGBC and respond to USGBC requests for additional construction data in the course of preparing the project for certification.
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PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

- 31 A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.
- 32
- 33
- 34

2.2 RECYCLED CONTENT OF MATERIALS

- 35 A. Credit MR 4.1: Building materials shall have recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of [10] percent of cost of materials used for Project.
- 36
- 37
- 38 1. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
- 39
- 40 2. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
- 41
- 42 3. Do not include plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.
- 43

2.3 REGIONAL MATERIALS

- 44 A. Credit MR 5: Provide a minimum of 10 percent of building materials (by cost) that are regional materials.
- 45
- 46

2.4 LOW-EMITTING MATERIALS

- 47 A. Credit IEQ 4.1: For field applications that are inside the weatherproofing system, use adhesives and sealants shall comply with the following limits for VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
- 48
- 49
- 50 1. Wood Glues: 30 g/L.
- 51 2. Metal to Metal Adhesives: 30 g/L.
- 52 3. Adhesives for Porous Materials (Except Wood): 50 g/L.
- 53 4. Plastic Foam Adhesives: 50 g/L.
- 54 5. Carpet Adhesives: 50 g/L.
- 55 6. Carpet Pad Adhesives: 50 g/L.
- 56 7. VCT and Asphalt Tile Adhesives: 50 g/L.
- 57 8. Cove Base Adhesives: 50 g/L.
- 58 9. Gypsum Board and Panel Adhesives: 50 g/L.
- 59 10. Rubber Floor Adhesives: 60 g/L.
- 60 11. Ceramic Tile Adhesives: 65 g/L.
- 61 12. Multipurpose Construction Adhesives: 70 g/L.
- 62 13. Contact Adhesive: 80 g/L.
- 63 14. Structural Wood Member Adhesive: 140 g/L.
- 64 15. Special Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, rubber or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
- 65
- 66 16. Top and Trim Adhesive: 250 g/L.
- 67 17. ABS Welding Compounds: 325 g/L.
- 68 18. CPVC Welding Compounds: 490 g/L.
- 69 19. PVC Welding Compounds: 510 g/L.
- 70 20. Adhesive Primer for Plastic: 550 g/L.
- 71 21. Plastic Cement Welding Compounds: 350 g/L.
- 72 22. ABS Welding Compounds: 400 g/L.
- 73 23. CPVC Welding Compounds: 490 g/L.
- 74 24. PVC Welding Compounds: 510 g/L.
- 75 25. Adhesive Primer for Plastic: 650 g/L.
- 76 26. Sheet Applied Rubber Lining Adhesive: 850 g/L.
- 77 27. Aerosol Adhesive, General Purpose Mist Spray: 65 percent by weight.
- 78 28. Aerosol Adhesive, General Purpose Web Spray: 55 percent by weight.
- 79 29. Special Purpose Aerosol Adhesive (All Types): 70 percent by weight.
- 80 30. Other Adhesives: 250 g/L.
- 81 31. Architectural Sealants: 250 g/L.
- 82 32. Non-membrane Roof Sealants: 300 g/L.
- 83 33. Single-Ply Roof Membrane Sealants: 450 g/L.
- 84 34. Other Sealants: 420 g/L.
- 85 35. Sealant Primers for Nonporous Substrates: 250 g/L.
- 86 36. Sealant Primers for Porous Substrates: 775 g/L.
- 87 37. Modified Bituminous Sealant Primers: 500 g/L.
- 88 38. Other Sealant Primers: 750 g/L.
- 89 B. Credit IEQ 4.2: For field applications that are inside the weatherproofing system, paints and coatings shall comply with the following VOC content limits when calculated according to 40 CFR 59 (EPA method 24):
- 90
- 91 1. Flat Paints and Coatings: VOC not more than 50 g/L.
- 92 2. Nonflat Paints and Coatings: VOC not more than 150 g/L.
- 93 3. Dry-Fog Coatings: VOC not more than 400 g/L.
- 94 4. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
- 95 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.

- 1 6. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
- 2 7. Pretreatment Wash Primers: VOC not more than 420 g/L.
- 3 8. Clear Wood Finishes, Varnishes: VOC not more than 350g/L.
- 4 9. Clear Wood Finishes, Lacquers: VOC not more than 550g/L.
- 5 10. Floor Coatings: VOC not more than 100g/L.
- 6 11. Shellacs, Clear: VOC not more than 730g/L.
- 7 12. Shellacs, Pigmented: VOC not more than 550g/L.
- 8 13. Stains: VOC not more than 250g/L.
- 9 C. Credit IEQc4.3: All flooring must comply with the following as applicable to the project scope:
- 10 1. All carpet and carpet cushion must meet the requirements of the Carpet and Rug Institute Green Label Program.
- 11 2. All carpet adhesive must have VOC limit of 50 g/L.
- 12 3. All hard surface flooring must meet the requirements of the FloorScore Standard.
- 13 4. Concrete, wood, bamboo and cork floor finishes and tile setting adhesives must meet the requirements of South Coast Air Quality Management District (SCAQMD) Rules 1113 and 1168.
- 14
- 15 D. Credit IEQc4.4: Do not use composite wood, agrifiber products or adhesives that contain urea- formaldehyde resin. FF & E are not included. Products include:
- 16 1. Panel substrates
- 17 2. Door cores
- 18 3. Strawboard
- 19 4. Wheatboard
- 20 5. Plywood
- 21 6. Medium density fiberboard (MDF)
- 22 7. Particleboard
- 23

PART 3 – EXECUTION

3.1 NONSMOKING BUILDING

- A. Smoking is not permitted on Madison City Parks Property.

3.2 CONSTRUCTION ACTIVITIES POLLUTION PREVENTION

- A. SS Prerequisite 1 Construction Activities Pollution Prevention:
 1. Follow LEED instructions in LEED NCv3.0 Reference Guide and complying with Section 31 25 13, Erosion Control.
 2. Contractor is responsible for completing the LEED online credit template and attaching the following information to the template:
 - a. Provide record of compliance with Erosion and Sediment Control Plan:
 - i. Monthly photographs of barriers and containment.
 - ii. Monthly photographs of dust control measures
 - iii. Records of inspections by agency in charge of overseeing compliance.
 3. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory for USGBC submission.

3.3 CONSTRUCTION WASTE MANAGEMENT

- A. Credit MRc2: Comply with Division 1 Section "Construction Waste Management and Disposal".
 1. Contractor is responsible for completing the LEED online credit template. Attached documentation in support of the credit shall include:
 - a. Monthly photographs of waste recycling sorting area including:
 - i. Debris control fencing.
 - ii. Signage clearly identifying the containers content.
 - b. Spreadsheet containing the following information:
 - i. Diverted materials description.
 - ii. Diverted materials/waste hauler name.
 - iii. Date of each haul.
 - iv. Quantity of material in each haul.
 - c. Copies of recycling vendor and waste hauler tipping receipts.
 2. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory for USGBC submission.

3.4 RECYCLED CONTENT OF BUILDING MATERIALS

- A. Credit MRc4: Recycled Content:
 1. Follow LEED instructions in LEED NCv3.0 Reference Guide.
 2. Provide record showing the preconsumer and post-consumer recycled content of all materials specified in Divisions 2 - 32.
 3. Contractor is responsible for completing the LEED online credit template and attaching the following information to the template:
 - a. Spreadsheet containing the following information:
 - i. The description of each material in each product specified in Divisions 2 - 32.
 - ii. Material manufacturer's name.
 - iii. Material cost.
 - iv. Percent preconsumer recycled content of each material.
 - v. Percent post-consumer recycled content of each material.
 - vi. Recycled content information source.
 - b. Copies of vendors literatures or a statement from vendors on vendor's letterhead confirming the figures used in the spreadsheet.
 4. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory for USGBC submission.

3.5 REGIONAL MATERIALS

- A. Credit MRc5: Regional Materials:
 1. Follow LEED instructions in LEED NCv3.0 Reference Guide.
 2. Provide record showing the manufacturing location for all materials specified in Divisions 2 - 32.
 3. Contractor is responsible for completing the LEED online credit application and attaching the following information to the application:
 - a. Copies of vendors literatures or a statement from vendors on vendor's letterhead confirming the figures used in the spreadsheet.
 4. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory for USGBC submission.

3.8 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

- A. Credit IEQc3.1: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."
 1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Division 1 Section "Temporary Facilities and Controls", install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
 2. Replace all air filters immediately prior to occupancy.
 3. Provide record of compliance with Indoor Air Quality Management Plan:
 - a. Monthly photographs of equipment and ductwork protection.
 - b. Monthly photographs of filters used to protect air distribution and equipment.
 - c. Contractor's report documenting that MERV 8 filters were used to protect equipment during construction and MERV 13 filters were installed prior to occupancy.
- B. Credit IEQc3.2: Indoor Air Quality Management Plan – Before Occupancy:
 1. Option 1 – Flush Out: After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 deg F and a relative humidity no higher than 60 percent.

OR
 2. Option 2 - Air-Quality Testing: If the Contractor chooses to test for compliance with LEED Credit IEQc3.2 the following is required:

- 1 a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's
- 2 "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "Green Building Design
- 3 and Construction Reference Guide".
- 4 b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:
- 5 i. Formaldehyde: 27 ppb.
- 6 ii. Particulates (PM10): 50 micrograms/cu. m.
- 7 iii. Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
- 8 iv. 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
- 9 v. Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.
- 10
- 11 c. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the
- 12 specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting
- 13 non-complying building areas, samples are to be taken from the same locations as the first test.
- 14 d. Air-sample testing shall be conducted as follows:
- 15 i. All measurements shall be conducted prior to occupancy but during normal occupied hours and with building ventilation system starting at
- 16 the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air
- 17 testing.
- 18 ii. Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Non-fixed
- 19 furnishings such as workstations and partitions are encouraged, but not required to be in place for the testing.
- 20 iii. Number of sampling locations will vary depending on the size of building and number of ventilation systems. For each portion of building
- 21 served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous
- 22 floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.
- 23 iv. Air samples shall be collected between 3 and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum four-
- 24 hour period.
- 25
- 26 3. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory for USGBC submission.

3.9 ENVELOPE AIR LEAKAGE TESTING

- 28 A. The new construction shall have an air leakage rate that does not exceed set values when tested in accordance with the U.S. Army Corps of Engineers Air Leakage
- 29 Test Protocol for Building Envelopes (Test Protocol).
- 30 1. Maximum Building Envelope Air Leakage Requirement (CFM 75/sq ft); 0.25.
- 31 B. Test Protocol: U.S. Army Corps of Engineers; Air Leakage Test Protocol for Building Envelopes; Version 3 dated May 11, 2012.
- 32 1. Maximum Building Envelope Air Leakage Requirement (CFM 75/sq ft); 0.25.
- 33 C. Project Test Protocol Environment:
- 34 1. The ARCHITECT shall define the test boundary and for calculating the associated surface area to be used in the normalized air leakage calculation. The
- 35 location and surface area of the test boundary shall be clearly defined in the project documents.
- 36 2. When possible, the whole building will be tested as a single space (single zone).
- 37 3. Project HVAC systems and equipment cannot meet requirement, provide temporary systems and equipment.
- 38 D. Test Protocol Summary:
- 39 1. The air leakage test shall be performed in accordance with the Test Protocol.
- 40 2. The test consists of measuring the flow rates required to establish a minimum of ten (10) positive and ten (10) negative approximately equally spaced
- 41 induced envelope pressures. Induced envelope pressure test points shall be averaged over at least 10 seconds and shall be no lower than 40 Pa for a two-
- 42 sided (positive and negative) test and 50 Pa for a single sided test. The highest point shall be at least 75 Pa, and there shall be at least 25 Pa difference
- 43 between the lowest and highest point. Pressures in the extremities of the envelope shall not differ from one another by more than 10% of the average
- 44 induced envelope pressure. Twelve pre and twelve post-baseline pressure points shall be taken across the envelope with respect to the outdoors where
- 45 each point is an average taken over at least 10 seconds. The maximum absolute baseline pressure point value shall not exceed 30% of the minimum
- 46 induced envelope pressure test point used in the analysis. There are no further restrictions on wind speed or temperature during the test.
- 47 3. Building envelopes shall be tested under pressurization and de-pressurization conditions unless an air flow in excess of 200,000 CFM75 is required to
- 48 perform the test and the only air flow testing method can pressurize or depressurize but not both.
- 49 4. The mean value (of pressurization and depressurization if both are performed) of the air leakage flow calculated from measured data at 0.3 in wc (75 Pa)
- 50 shall not exceed the building envelope air leakage requirements in Table 3.2.1 and the confidence intervals requirements of Table 4.10.1.
- 51 E. Performance Requirements and Substantiation:
- 52 1. Submit the qualifications and experience of the testing entity for approval.
- 53 2. Verify that the building envelope has been sufficiently completed for testing.
- 54 3. Notify the ARCHITECT at least three working days prior to tests being conducted to provide them the opportunity to witness the testing procedures.
- 55 4. Test the completed building and demonstrate that the air leakage rate of the building envelope does not exceed the requirements.
- 56 5. Determine air leakage pathways using ASTM E1186-03(2009) 'Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier
- 57 Systems'. Retest after corrective work is completed as necessary to achieve the whole building air leakage rate requirements.
- 58 6. Provide the ARCHITECT with written test results of all testing and inspection procedures.


3.10 LOW EMITTING MATERIALS

- 61 A. Credit IEQc4.1 through Credit MRc4.4: Low Emitting Materials:
- 62 1. Follow LEED instructions in LEED NCv3.0 Reference Guide.
- 63 2. Contractor is responsible for completing the LEED online credit template and attaching the following information to the template:
- 64 a. Copies of vendor's literature or MSDS sheets confirming the figures used in the spreadsheet.
- 65 3. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory for USGBC submission.
- 66

3.11 SUPPLEMENT

- 68 A. The supplement listed below, following "End of Section," is a part of this Specification:
- 69 1. LEED for New Construction v3.0 Registered Project Checklist.
- 70
- 71

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 LEED v3 for New Construction and Major Renovations Project Checklist 5-1-18										
18	0	1	7		Sustainable Sites				Possible	26
Y	?Y	?N	N	d/C						
Y				C	Prereq 1	Construction Activity Pollution Prevention				
1				d	Credit 1	Site Selection			1	
5				d	Credit 2	Development Density and Community Connectivity			5	
			1	d	Credit 3	Brownfield Redevelopment			1	
6				d	Credit 4.1	Alternative Transportation—Public Transportation Access			6	
			1	d	Credit 4.2	Alt Transportation—Bike Storage and Changing Rooms			1	
			3	d	Credit 4.3	Alternative Transportation—L.E. and Efficient Vehicles			3	
2				d	Credit 4.4	Alternative Transportation—Parking Capacity			2	
	1			C	Credit 5.1	Site Development—Protect or Restore Habitat			1	
1				d	Credit 5.2	Site Development—Maximize Open Space			1	
1				d	Credit 6.1	Stormwater Design—Quantity Control			1	
			1	d	Credit 6.2	Stormwater Design—Quality Control			1	
1				C	Credit 7.1	Heat Island Effect—Non-roof			1	
			1	d	Credit 7.2	Heat Island Effect—Roof			1	
1				d	Credit 8	Light Pollution Reduction			1	
Water Efficiency										
2	3	1	4		Water Efficiency				Possible Points:	10
Y	?Y	?N	N	d/C						
Y				d	Prereq 1	Water Use Reduction—20% Reduction				
	2		2	d	Credit 1	Water Efficient Landscaping			2 to 4	
						2	Reduce by 50%		2	
							No Potable Water Use for Irrigation		4	
			2	d	Credit 2	Innovative Wastewater Technologies			2	
2	1	1		d	Credit 3	Water Use Reduction			2 to 4	
						2	Reduce by 30%		2	
						1	Reduce by 35%		3	
						1	Reduce by 40%		4	
Energy and Atmosphere										
30	3	0	2		Energy and Atmosphere				Possible Points:	35
Y	?Y	?N	N	d/C						
Y				C	Prereq 1	Fundamental Commissioning of Building Energy Systems				
Y				d	Prereq 2	Minimum Energy Performance				
Y				d	Prereq 3	Fundamental Refrigerant Management				
16	3			d	Credit 1	Optimize Energy Performance			1 to 19	
							Improve by 12% for New Buildings		1	
							Improve by 14% for New Buildings		2	
							Improve by 16% for New Buildings		3	
							Improve by 18% for New Buildings		4	
							Improve by 20% for New Buildings		5	
							Improve by 22% for New Buildings		6	
							Improve by 24% for New Buildings		7	
							Improve by 26% for New Buildings		8	
							Improve by 28% for New Buildings		9	
							Improve by 30% for New Buildings		10	
							Improve by 32% for New Buildings		11	
							Improve by 34% for New Buildings		12	
							Improve by 36% for New Buildings		13	
							Improve by 38% for New Buildings		14	
							Improve by 40% for New Buildings		15	
						16	Improve by 42% for New Buildings		16	
						1	Improve by 44% for New Buildings		17	
						1	Improve by 46% for New Buildings		18	
						1	Improve by 48%+ for New Buildings		19	
7				d	Credit 2	On-Site Renewable Energy			1 to 7	
							1% Renewable Energy		1	
							3% Renewable Energy		2	
							5% Renewable Energy		3	
							7% Renewable Energy		4	
							9% Renewable Energy		5	
							11% Renewable Energy		6	
						7	13% Renewable Energy		7	
2				C	Credit 3	Enhanced Commissioning			2	
2				d	Credit 4	Enhanced Refrigerant Management			2	

3				C	Credit 5	Measurement and Verification	3
			2	C	Credit 6	Green Power	2
Materials and Resources							
4	2	0	8	d/C	Materials and Resources		Possible Points: 14
Y	?Y	?N	N				
Y				d	Prereq 1	Storage and Collection of Recyclables	
			3	C	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
						Reuse 55%	1
						Reuse 75%	2
						Reuse 95%	3
			1	C	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural	1
2				C	Credit 2	Construction Waste Management	1 to 2
						50% Recycled or Salvaged	1
					2	75% Recycled or Salvaged	2
			2	C	Credit 3	Materials Reuse	1 to 2
					1	Reuse 5%	1
					1	Reuse 10%	2
1	1			C	Credit 4	Recycled Content	1 to 2
					1	10% of Content	1
					1	20% of Content	2
1	1			C	Credit 5	Regional Materials	1 to 2
					1	10% of Materials	1
					1	20% of Materials	2
			1	C	Credit 6	Rapidly Renewable Materials	1
			1	C	Credit 7	Certified Wood	1
Indoor Environmental Quality							
12	0	0	3		Indoor Environmental Quality		Possible Points: 15
Y	?Y	?N	N	d/C			
Y				d	Prereq 1	Minimum Indoor Air Quality Performance	
Y				d	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1				d	Credit 1	Outdoor Air Delivery Monitoring	1
			1	d	Credit 2	Increased Ventilation	1
1				C	Credit 3.1	Construction IAQ Management Plan—During Construction	1
1				C	Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1				C	Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1				C	Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1				C	Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1				C	Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber	1
			1	d	Credit 5	Indoor Chemical and Pollutant Source Control	1
1				d	Credit 6.1	Controllability of Systems—Lighting	1
			1	d	Credit 6.2	Controllability of Systems—Thermal Comfort	1
1				d	Credit 7.1	Thermal Comfort—Design	1
1				d	Credit 7.2	Thermal Comfort—Verification	1
1				d	Credit 8.1	Daylight and Views—Daylight	1
1				d	Credit 8.2	Daylight and Views—Views	1
Innovation and Design Process							
2	4	0	0		Innovation and Design Process		Possible Points: 6
Y	?Y	?N	N				
	1			d	Credit 1.1	Innovation in Design: Pursue low-emitting furnishings per LEED-CI	1
	1			C	Credit 1.2	Innovation in Design: Exemplary Performance for Enhanced Cx	1
1				d	Credit 1.3	Innovation in Design: EAc2: 17.5% On-Site Renewable Energy	1
	1			d	Credit 1.4	Innovation in Design: Water Reuse in Greenhouse	1
	1			d	Credit 1.5	Innovation in Design: Green Building Education	1
1				d	Credit 2	LEED Accredited Professional	1
Regional Priority Credits							
4	1	0	0		Regional Priority Credits		Possible Points: 4
Y	?Y	?N	N	d/C			
1				d	Credit 1.1	Regional Priority: EAc2	1
1				d	Credit 1.2	Regional Priority: SSc2	1
1				d	Credit 1.3	Regional Priority: SSc4.4	1
1				d	Credit 1.4	Regional Priority: SSc6.1	1
	1			d	Credit 1.5	Regional Priority: WEc3	
72	13	2	24		Total		Possible Points: 110
Y	?Y	?N	N				

1
2
3
4

END OF SECTION

**SECTION 01 91 00
GENERAL COMMISSIONING REQUIREMENTS**

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PART 1 – GENERAL

1.01. RELATED DOCUMENTS

- A. Owner Program Requirements and Basis of Design
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1.02. GENERAL DESCRIPTION

- A. Commissioning is the process of verifying and validating that all building systems are installed and perform interactively according to the design intent; that systems are efficient and cost effective to operate and meet the Owner's operational needs; that the installation is adequately documented; and that Operators are adequately trained. It serves as a tool to minimize post-occupancy operational problems. It establishes testing and communication protocols in an effort to advance the building systems from installation to full dynamic operation and optimization.
- B. Commissioning Provider shall work with the Contractor and the Engineer to direct and oversee the Commissioning process.
 - 1. Utilize Autodesk BIM-360 collaboration software to maintain an observation log, equipment installation and start-up status.
 - 2. Contractors and subcontractors shall interface with the Cx process using BIM-360 web interface and/or an Apple iPad.
 - 3. Generate a commissioning plan including schedule.
 - 4. Integrate commissioning activities into the general construction schedule.
 - 5. Provide commissioning specifications
 - 6. Lead commissioning kick-off and coordination meetings.
 - 7. Verify that applicable equipment and systems are installed according to the contract documents, manufacturer's recommendation, and industry accepted minimum standards and that they receive adequate operational checkout by the installing contractors.
 - 8. Verify and document test, adjust and balance is complete and accurate.

- 1 9. Verify and document proper performance of equipment and systems.
- 2 10. Verify that operation and maintenance documentation left onsite is complete.
- 3 11. Verify that the owner's operating personnel are adequately trained.
- 4 12. Provide a Final Commissioning report.
- 5 C. The Commissioning Plan details the commissioning process.
- 6 D. The Commissioning process does not take away from or reduce the responsibility of the system designers or
- 7 installing contractors to provide a finished and fully functional product as defined in the plans and specifications.
- 8 E. This Section and other Sections of the specifications detail the Contractor's responsibilities relative to the
- 9 Commissioning process. It expands on the Commissioning Plan, which covers the roles and responsibilities of all
- 10 Parties. It also indicates the details of the Functional Performance Testing in which the Contractor must participate.
- 11

1.03. SUMMARY

- 12 A. Section includes:
- 13 1. General requirements that apply to implementation of commissioning without regard to specific systems,
- 14 assemblies, or components.
- 15 B. Specific Equipment/systems to be utilized is "to be determined" (TBD) at this time. At minimum, the following
- 16 general equipment/systems shall be commissioned:
- 17 1. HVAC system and controls.
- 18 2. Lighting control system.
- 19 3. Domestic hot water system.
- 20 4. Metering.
- 21 C. References:
- 22 1. ASHRAE Standard 202-2013, "The Commissioning Process for Building and Systems"
- 23 2. ASHRAE Guideline 0-2013, "The Commissioning Process"
- 24 3. ASHRAE Guideline 1.1-2007, "HVAC & R Technical Requirements for the Commissioning Process"
- 25 4. ASHRAE Guideline 4-2008, "Preparation of Operating and Maintenance Documentation for HVAC&R
- 26 Systems"
- 27 5. American Society for Testing and Materials (ASTM)
- 28 6. BCA - Building Commissioning Association
- 29 7. Electronics Industry Association/Telecommunications Industry Association (EIA/TIA)
- 30 8. International Building Code (IBC)
- 31 9. Illuminating Engineering Society (IES)
- 32 10. Institute of Electrical and Electronics Engineers (IEEE)
- 33 11. International Electrical Testing Association (NETA)
- 34 12. National Electrical Manufacturers Associates (NEMA)
- 35 13. National Fire Protection Association (NFPA)
- 36 14. NEBB - Procedural Standards for Building Systems Commissioning
- 37 15. National Electric Code (NEC)
- 38 16. NETA-ATS, Testing Standards
- 39 17. Underwriters Laboratory, Inc. (UL)
- 40 18. U.S. Green Building Council (USGBC)
- 41 19. Washington State Energy Code (WSEC)
- 42 20. Washington Sustainable Schools Protocol (WSSP) Fundamental Commissioning
- 43 21. WSSP Enhanced Commissioning
- 44 D. Related Sections:
- 45 1. Section 23 05 93 "Testing, Adjusting and Balancing".
- 46 2. Section 23 09 00 "Controls "
- 47
- 48

1.04. DEFINITIONS

- 49 1. Acceptance Phase: This is the phase of the project when the facility and its systems and equipment are
- 50 inspected, tested, verified, and documented; and when most of the Functional Performance Testing and
- 51 formal training occurs. This will generally occur after the Construction Phase is complete (start-up and
- 52 checks have been accomplished). The Acceptance Phase typically begins with Substantial Completion and
- 53 ends with Functional Completion.
- 54 2. A/E: General reference to the Architect/Engineer lead-design entity.
- 55 3. Building Automation System (BAS): The computer-based heating, ventilation and air-conditioning (HVAC)
- 56 control or automation system.
- 57

- 1 4. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections
2 used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The
3 document includes both narrative descriptions and lists of individual items that support the design process.
- 4 5. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and
5 documentation requirements of the commissioning process.
- 6 6. Commissioning Authority (CA): The Party retained by the Owner who will oversee the Commissioning
7 process as well as develop and stipulate many of the Commissioning requirements. They will also manage
8 the Commissioning process, and ensure and validate that systems and equipment are designed, installed
9 and tested to meet the Owner's requirements.
- 10 7. Commissioning Coordinator (Cx): This refers to the Individual within each of the various Parties that is
11 designated the point of contact for that Party relative to Commissioning activities.
- 12 8. Commissioning Portal: This is an internet hub for the collaboration on Commissioning information. This
13 portal will act as a hub for posting electronic information.
- 14 9. Commissioning Plan: The Commissioning Plan is a part of the Contract Documents and outlines many of
15 responsibilities, procedures and tasks throughout the Commissioning process. It also describes the
16 Functional Performance Tests that will be performed during the Acceptance Phase. The Contractor must
17 have an understanding of commissioning process and the Contractor requirements within the plan.
- 18 10. Commissioning Team (CxT): The group of Parties involved in the commissioning process for any given
19 system. The Commissioning Team will include a core group involved with all systems. This core group will
20 typically include the CA, the Construction Manager's Commissioning Coordinator (CM-CxC), the Owner's
21 Commissioning Coordinator (O/O-CxC) and the General Contractor's Commissioning Coordinator (GC-CxC).
22 On any given system, the Commissioning Team will also include the Commissioning Coordinator for the
23 Contractor(s) responsible for the system or equipment.
- 24 11. Contractor: As used herein, 'Contractor' is a general reference to the installing Party and can therefore
25 refer to the General Contractor, subcontractors, or vendors as inferred by its usage. The contractor
26 generally refers to the person or entity who has agreed with the owner to perform work. Whereas the
27 subcontractor is any person other than the contractor who agrees to furnish or furnishes any supplies,
28 material, equipment, or services of any kind in connection with the work.
- 29 12. Construction Manager (CM): The Party retained by the Owner to represent the Owner and make decisions
30 on the Owner's behalf throughout the design and construction process.
- 31 13. Construction Phase: Phase of the project during which the facility is constructed and/or systems and
32 equipment are installed and started. Contractor and subcontractors complete the installation, complete
33 start-up documentation, submit operation and maintenance information, establish trends, and perform
34 any other applicable requirements to get systems started. Contractor and Vendors may also conduct
35 equipment specific training. The Construction Phase will generally end upon completed start-up and test,
36 adjust and balance of systems and equipment.
- 37 14. Deficiency: A condition in the installation or function of a component, piece of equipment or system that
38 is not in compliance with the Contract Documents (that is, does not perform properly or is not complying
39 with the design intent).
- 40 15. Engineer: Licensed Professional Engineer that designed and stamped the project reflecting his or her
41 specific area of certification and expertise.
- 42 16. Factory Authorized Representative: An individual fully trained on the equipment and certified by the
43 manufacturer to start-up equipment, perform the respective task, and make reports.
- 44 17. Factory Testing: Testing of equipment off-site at the manufacturer's facility. The testing may be witnessed
45 by the members of the project team.
- 46 18. Factory Start-Up: Start-up of equipment by a Factory Authorized Representative.
- 47 19. Functional Performance Testing (FPT): The detailed and thorough testing of building systems and their
48 interactions with building components and other building systems.
- 49 20. IAQ: Indoor Air Quality.
- 50 21. Installation, Operation and Maintenance (I,O&M) Documentation: This refers to Contractor-developed
51 documentation designed to address the needs of facilities personnel and customized for the context of the
52 specific facility and installation. The foundation of I,O&M Documentation is manufacturer's literature
53 (including 'installation and operational and maintenance manual', parts lists, troubleshooting guides, etc.)
54 as well as Contractor-developed instructions for start-up and shut-down, sequences, and other installation-
55 specific information. I,O&M Documentation content is a subset of the Facility Manual, so it is common for
56 only one or the other to be specified. All documentation shall be submitted to Owner in electronic format.
57 See Division 1, Section 01785 for additional information.

- 1 22. Measurement and Verification (M&V): Period after commissioning where systems are trended and
- 2 analyzed for proper operations and for hitting energy savings requirements. This is a separate service apart
- 3 from commissioning.
- 4 23. Observation Log: This is a list that is maintained and updated by the commissioning provider that includes
- 5 all Observation Items that relate to Commissioning activities and site observations requiring contractor
- 6 action or response.
- 7 24. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and
- 8 the expectations of how it will be used and operated. These include Project goals, measurable performance
- 9 criteria, cost considerations, benchmarks, success criteria, and supporting information.
- 10 25. Opposite Season: The season opposite that when the majority of the testing occurs.
- 11 26. Installation verification: Preliminary testing accomplished during a scheduled system outage to verify
- 12 system functionality prior to placing the system/equipment into preliminary service.
- 13 27. Start-Up: Refers to the quality control process whereby the Contractor verifies the proper installation of a
- 14 device or piece of equipment, executes the manufacturer's starting procedures, completes the Start-Up
- 15 Checklist, energizes the device, verifies that it is in proper working order and ready for dynamic testing,
- 16 including Start-Up Tests.
- 17 28. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately,
- 18 they shall mean "as-built" systems, subsystems, equipment, and components.
- 19 29. TAB: Can refer to the test, adjust, and balance process or the Testing, Adjusting, and Balancing Contractor.
- 20 30. Transition Period: Time period after FPT completed to operate systems to purge the building and stabilize
- 21 equipment operations. Time is also used by the CA to test system performance.
- 22 31. Trending: Monitoring and recording a history of parameters typically using the BAS.
- 23 32. Warranty Phase: Includes the early occupancy of the building and can continue through the Warranty
- 24 Period and at least into the opposite season from when it was initially tested.
- 25

26 **1.05. COMMISSIONING TEAM**

- 27 A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or
- 28 she represents, explicitly organized to implement the commissioning process through coordinated action. The
- 29 commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project
- 30 superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CA.
- 31 B. Members Appointed by Owner:
- 32 1. CA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning
- 33 team to implement the commissioning process. Owner will engage the CA under a separate contract.
- 34 2. Representatives of the facility user and operation and maintenance personnel.
- 35 3. Architect and engineering design professionals.
- 36

37 **1.06. OWNER RESPONSIBILITIES**

- 38 A. Provide the OPR documentation to the CA and Contractor for information and use.
- 39 B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.
- 40 C. Provide the BoD documentation, prepared by Architect and Engineer and approved by Owner, to the CA and
- 41 Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance
- 42 training plan.
- 43

44 **1.07. COORDINATION MANAGEMENT PROTOCOL**

- 45 A. Coordination responsibilities and management protocols relative to Commissioning are initially defined below but
- 46 will be refined and documented in the Commissioning Plan. Contractor shall have input in the protocols and all
- 47 parties will commit to scheduled obligations. The CA will record and distribute.
- 48 1. Submittals and Shop Drawings: CM shall distribute the submittal log to the CA. CA shall review the
- 49 submittal log and communicate which submittals need to be forwarded.
- 50 2. CA Review Comments for Shop Drawings: An email reply is sent directly to the CM, A/E, and Owner by the
- 51 CA. The Owner and A/E will consider and incorporate at their discretion.
- 52 3. Deficiencies Identified by the Commissioning Provider: When the CA identifies a deficiency the CA shall
- 53 make a good faith assessment of responsible parties. Those parties, as well as the Owner and CM shall be
- 54 notified of the perceived deficiency. This communication is FOR INFORMATION ONLY and is not a direction
- 55 to resolve the deficiency or to take any action. Contractor may elect to accept responsibility and resolve
- 56 the deficiency. If the contractor contests either the deficiency or responsibility for that deficiency,
- 57 Contractor shall respond to that deficiency indicating disagreement. If responsibility is not agreed to via

- 1 the Commissioning dialogue, CM shall issue a work directive or RFI via the normal contractual channels to
2 resolve the issue.
- 3 4. Requests for Meetings: In general request by the contractor for a meeting with the CA shall be routed
4 through Owner and CM who will then determine the validity. Note that every attempt should be made to
5 deal with Commissioning issues at regularly scheduled Commissioning Meetings.
- 6 5. Control Sequence Modifications: CA shall review the sequences during the design and submittal phases
7 and address any known issues prior to the submittal approval. However, CA and the contractor may
8 incorporate minor changes to the sequence during testing when it is apparent that it improves the control
9 of the equipment but does not fundamentally change the sequence, subject to the approval of the Owner
10 and Engineer. Any and all changes must be thoroughly documented in the record documents.
- 11 6. Notification of Completion Milestones: Contractor shall notify the CA, Owner and CM at least one week
12 prior to any anticipated commissioning activity or commissioning milestone (such as FPT). The Owner or
13 CM (as applicable) shall then coordinate the scheduling of the activity between all required parties.
14 Notification shall be via email.
- 15 7. Observation Log: CA maintains a categorized Observation Log which tracks the Commissioning related
16 action items. Any party that is copied on an email resulting from an Observation Item posting may respond
17 to it and contribute to the dialogue. CA normally distributes a copy of the current open items on the action
18 list with each site visit report.
- 19 8. Start-Up Checklist and Test Documents: Minimum start-up and documentation requirements are listed in
20 the respective sections of the specifications for controls and mechanical commissioning. The Contractor
21 then performs the reviewed and approved Start-Up procedures, completes the documentation and signs,
22 and submits it. CA subsequently spot checks the procedures and documentation during the FPT. They are
23 then included in the Commissioning Record.
- 24 9. Functional Performance Test Documents: FPTs are witnessed and documented by the CA but performed
25 by the contractor. They are developed during the construction phase generally after completed submittals.
26 CA drafts and forwards the FPT procedures to the CM to be subsequently distributed to the subcontractors
27 for review by the CM. Contractors review and comment on the procedures. Throughout the
28 Commissioning process, CA maintains a current record of the testing procedures and keeps the
29 documentation up to date and accessible for all to access the current progress. Upon request, the CA will
30 provide an electronic copy of completed functional test procedures at any significant stage of Cx.
- 31 B. Coordination Between Testing Parties
- 32 1. Factory Start-Ups: For many systems and equipment, Factory Start-Ups are specified. The Contractor is
33 responsible for providing onsite support for the Factory representatives. These Factory Start-Ups will be
34 reviewed and checked during FPT. All costs associated with the Factory Start-Ups are included with the bid
35 unless otherwise noted. Contractor shall make notification of when Factory Start-Ups are occurring and
36 coordinate these with witnessing Parties. The CA and CxT members may witness Factory Start-Ups at their
37 discretion. Aspects of FPT accomplished during the Factory Start-Ups may be accomplished and approved
38 by the CA if they meet the intent of the FPT. It is assumed that the Factory representatives budget the
39 appropriate numbers of trips to support initial start-up, resolving equipment issues, TAB and training.
- 40 2. Independent Testing Agencies and Special Inspectors: For systems where contractor's independent testing
41 agencies or special inspectors are specified, the cost of this testing is included with the bid unless otherwise
42 noted. Much of the testing performed by these independent agencies or special inspectors will cover
43 aspects required in the Start-Up Procedures and FPTs.
- 44 3. Contractor, testing agencies, and special inspectors shall coordinate with the CA so that the CA can support
45 the testing (when necessary), witness the testing, and approve the applicable aspects of the FPTs. The
46 Contractor should not start up equipment or systems without CA approval.
- 47 4. The CA may independently spot-check work of the testing agencies or special inspector if the tests were
48 not witnessed. However, it is not the intent for the CA to re-accomplish testing by others that is specified
49 in the construction specifications.
- 50 5. Contractor is responsible for coordinating the efforts of testing agency or special inspector with that of the
51 Cx process. Documentation shall be contiguous and seamless and duplication will be avoided. Testing
52 agencies or special inspectors shall complete the documentation of the Cx process as required.

53
54 **1.08. CONTRACTOR RESPONSIBILITIES**

- 55 A. Construction Phase: The following delineates the commissioning-related responsibilities of the Contractor (and
56 their subcontractors) during the Construction Phase.
- 57 1. Include Commissioning requirements in price and plan for work.

- 1 2. Designate a CxC from each major subcontractor with activities related to commissioning. These CxCs are
- 2 to be the primary contacts for Commissioning activities.
- 3 3. Attend Construction Phase Commissioning Kick Off Meeting. The CxC and Project Manager from each
- 4 major subcontractor shall attend at a minimum.
- 5 4. The CxC shall attend all Commissioning progress meetings unless otherwise agreed to by the CA.
- 6 5. Remedy any deficiencies identified throughout construction.
- 7 6. Submit Start-Up Procedures along with the manufacturer's application, installation and start-up
- 8 information to the CA for review prior to implementation.
- 9 7. TAB shall submit Project specific TAB Plan and sample balancing forms for approval prior to starting work.
- 10 8. Contractor shall incorporate the Commissioning process into the construction schedule outlining generic
- 11 Commissioning tasks with precedents or prerequisites to each task. These tasks will apply to many systems
- 12 and the Contractor shall incorporate as such. Examples of enumerated tasks include:
- 13 a. Contractor preparation of the Training Plan.
- 14 b. Independent Testing Agency activities.
- 15 c. Contractor documentation of pipe pressure testing, flushing, and cleaning of applicable systems.
- 16 d. Documentation of the Start-Up Procedures for equipment and systems
- 17 e. TAB of applicable system
- 18 f. Training Events
- 19 g. Preparation of the O&M Manual content
- 20 h. FPT and Acceptance
- 21 i. Observation Period and System Optimization
- 22 j. Occupant or other Regulatory Agency testing or approval process
- 23 9. Coordinate the work of subcontractors, vendors, manufacturers, Testing Agencies and Special Inspectors
- 24 provided with the bid, and ensure that they are informed of and are adhering to the requirements of the
- 25 Commissioning process specified throughout the contract documents. Particular reference is made to
- 26 providing the required O&M Documentation; submittal of training materials and documentation of that
- 27 training; collaboration with the overall start-up and testing process; developing comprehensive integrated
- 28 procedures for scheduling and task notification and documenting them in a common format; and electronic
- 29 delivery requirements if applicable.
- 30 10. Provide assistance to the CA in preparation for the specific FPT procedures. Contractors, subcontractors
- 31 and vendors shall review the FPTs to ensure feasibility, safety and equipment protection and provide
- 32 necessary written alarm limits to be used during the tests. Damage caused to equipment performed in
- 33 accordance with the approved procedures that is the result of malfunctioning equipment or contract
- 34 deficiencies, shall be the responsibility of the Contractor.
- 35 11. Thoroughly complete and inspect installation of systems and equipment as detailed throughout Contract
- 36 Documents, as required by reference or industry standards, and as specifically indicated elsewhere this
- 37 section. The Contractor (and subcontractors) shall record, in the form of photographs, compliance to
- 38 and/or deviation from IAQ standards.
- 39 12. Contractor shall notify the CA at least 7 days in advance of any tests, start-ups, or training. CA shall witness
- 40 selected tests and start-ups. Notification shall be accompanied by a schedule showing the coordinated
- 41 start date and task duration and all open prerequisites
- 42 13. Start-up, TAB of systems and equipment prior to verification and FPT by the CA. Start-up procedures shall
- 43 be in accordance with Contract Documents, reference or industry standards, and Commissioning specs.
- 44 Provide skilled technicians who are qualified to do the work required. Provide factory trained/authorized
- 45 technicians where required by the contract documents and stated in the applicable technical section.
- 46 Generally start-up and testing shall proceed from device checkout, to component checkout, to system
- 47 checkout, to inter-system checkout.
- 48 14. Record start-up and testing procedures on start-up forms or checklists and certify that the systems and
- 49 equipment have been started and/or tested in accordance with the requirements specified above. Each
- 50 task or item shall be indicated with the party actually performing the task or procedure.
- 51 15. Demonstrate the operation of all systems as specified.
- 52 16. Certify that systems have been installed and are operating per Contract Documents and OEM prior to FPT
- 53 and acceptance.
- 54 17. Support/Assist in the building flush-out per Construction Indoor Air Quality, Section 01561. If the flush-out
- 55 is not performed or is incomplete then the Contractor shall coordinate an air quality test from an approved
- 56 Industrial Hygienist after construction is complete to verify the chemical air contaminants are below the
- 57 specified limits.
- 58 18. Maintain an updated set of Record Documentation as required by the Contract Documents.

- 1 19. Conduct and document Equipment and Systems Training events as required by this Section and by
2 applicable sections of the Specifications pertaining to each piece of equipment or system and general
3 training requirements.
- 4 20. Operate systems under direction of the CA during FPT's and other acceptance testing.
- 5 B. Acceptance Phase: The following delineates the commissioning-related responsibilities of the Contractor (and their
6 subcontractors) during the Acceptance Phase.
- 7 1. Will work in conjunction with CA in FPT and will generally include the following:
- 8 a. Operate and Manipulate systems and equipment to facilitate testing (as dictated in this section,
9 relevant technical sections and the Commissioning Plan).
- 10 b. Operate and Manipulate BAS and other control systems to facilitate FPT (as dictated in this section,
11 relevant technical sections and the Commissioning Plan).
- 12 c. Provide Point to Point and Devise Calibration reports prior to coordination to facilitate FPT.
- 13 2. Correct any work not in accordance with Contract Documents.
- 14 3. Maintain record documentation and update and resubmit it after Functional Completion.
- 15 4. Compensate the Owner for additional CA fees and expenses incurred to retest equipment and systems
16 following testing failures.
- 17 5. Monitor systems, equipment and areas throughout the Acceptance Phase. Log and diagnose all alarms
18 during this period. Maintain trends and logs of all parameters. Forward the logs and trends on a weekly
19 basis throughout the Acceptance Phase.
- 20 C. Warranty Phase: The following delineates the commissioning-related responsibilities of the Contractor (and their
21 subcontractors) during the Warranty Phase.
- 22 1. Provide warranty service.
- 23 2. Conduct BAS Sequence Training.
- 24 3. Respond to and document Warranty issues.
- 25 4. Participate as required in the opposite season testing.
- 26 5. Correct any deficiencies identified throughout the Warranty Phase.
- 27 6. Update record documentation to reflect any changes made throughout the Warranty Phase and resubmit
28 final Record Drawings and data records at the close of the Warranty period.

30 1.09. DESIGN REVIEW

- 31 A. The A/E provides the CA a design development (DD) set for review; the drawing set should be near 100% complete.
32 The CA reviews the design set for inconsistencies, misses, OPR & BOD compliance, and opportunities for
33 improvement. The CA documents their comments and provides them to the A/E for incorporation into the design
34 set.
- 35 B. The A/E provides a Construction Document (CD) set that is near 50% and/or 90% complete to the CA for review.
36 The CA reviews the set to verify previous comments have been addressed and to identify any further misses or
37 opportunities. The CA documents their comments and provides them to the A/E for incorporation into the
38 construction set.

40 1.10. COMMISSIONING PLAN

- 41 A. The CA will develop the Commissioning Plan and its elements shall be included in the project schedule when
42 approved by the owner or construction manager. The following provides an overview of the Commissioning tasks
43 discussed in the Commissioning Plan.
- 44 1. Commissioning program overview - Goals & Objectives, general project information, system to be
45 commissioned
- 46 2. Commissioning team - Team members, roles & responsibilities, communications & protocols, meetings and
47 management
- 48 3. Commissioning process activities - Document owner's project requirements, review the basis of designs,
49 review submittals, development of system functional performance testing, verify system performance,
50 report deficiencies & the resolution process, accepting the building system and training
- 51 4. Commissioning schedule - A commissioning schedule will typically include start and end dates for the
52 following.
- 53 a. Design set review
- 54 b. CD set review
- 55 c. Bid packages released
- 56 d. Distributed power available
- 57 e. Distributed water available
- 58 f. Start-up tests

- 1 g. Point to Point
- 2 h. TAB
- 3 i. Functional performance testing
- 4 j. Training
- 5

1.11. OBSERVATION LOG

- 7 A. CA shall maintain an Observation Log (required information, identified deficiencies, work required, etc.) that
- 8 relates to Commissioning. Each item shall be tracked with the initiator, the parties responsible, due date, the date
- 9 of closure, and a description of the resolution. Each item shall be categorized for sorting and tracking and for
- 10 documentation on applicable forms.
- 11 B. CA will disseminate this list as appropriate to keep all parties informed.
- 12 C. All parties indicated as responsible for an action item shall respond. The preferred response method is via e-mail.
- 13 Response with a plan of action (either repair or plan to resolve) is expected within 48 hours.
- 14

1.12. SUBMITTAL

- 16 A. The CA will provide appropriate contractors with a specific request for the type of submittal documentation the
- 17 CA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal
- 18 process and protocol of the construction team. At minimum, the request will include the manufacturer and model
- 19 number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation,
- 20 O&M data, performance data, any performance test procedures, control drawings and details of owner contracted
- 21 tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the
- 22 actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the
- 23 Commissioning Provider. All documentation requested by the CA will be included by the Subs in their O&M manual
- 24 contributions.
- 25 B. The Commissioning Provider will review and provide comment on submittals related to the commissioned
- 26 equipment for conformance to the Contract Documents as it relates to the commissioning process, to the
- 27 functional performance of the equipment and adequacy for developing test procedures. This review is intended
- 28 primarily to aid in the development of functional testing procedures and only secondarily to verify compliance
- 29 with equipment specifications. The Commissioning Provider will notify the CM, Owner Representative, or A/E as
- 30 requested, of items missing or areas that are not in conformance with Contract Documents and which require
- 31 resubmission.
- 32 C. The CA may request additional design narrative from the A/E and Controls Contractor, depending on the
- 33 completeness of the design intent documentation and sequences provided with the Specifications.
- 34 D. These submittals to the CA do not constitute compliance for O&M manual documentation. The O&M manuals are
- 35 the responsibility of the Contractor, though the CA will review and approve them.
- 36 E. Contractor's responsibility for deviations in submittals from requirements of the Contract Documents is not
- 37 relieved by the Commissioning Provider's review.
- 38

PART 2 - PRODUCTS**2.01. INSTRUMENTATION**

- 42 A. All test instruments described in this section shall be acceptable for any portion of the commissioning process
- 43 herein described. All instruments shall conform to the standards specified in the most recent edition of "NEBB
- 44 Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" in regard to accuracy and
- 45 calibration status. Current calibration certificates must be available to the CA as requested.
- 46 B. Test instrument accuracy and resolution must match or exceed that of the system component being verified or
- 47 calibrated.
- 48 C. Test instruments must be used within guidelines as recommended by instrument manufacturer. All measuring
- 49 methods must be appropriate to the instrument application and measurements must be repeatable under
- 50 equivalent conditions.
- 51 D. Standard Testing Instrumentation: Standard instrumentation normally used for performance assessment and
- 52 diagnosis will be provided by Cx/Contractor. These include:
 - 53 1. Electronic Manometer (for Air and Flow Hood)
 - 54 2. Electronic Manometer (for Water)
 - 55 3. Temperature Instruments
 - 56 4. Humidity Instruments
 - 57 5. CO2 Instrument
 - 58 6. Sound Meter

- 1 7. Electronic Multimeter
- 2 8. Tachometer
- 3 9. Ultrasonic Flow Meter
- 4 10. Thermal Infrared Camera
- 5 11. Others as required
- 6
- 7

PART 3 - EXECUTION

3.01. INSTALLATION VERIFICATION

- 10 A. All equipment, components, and devices applicable to installation verification must be installed, and the installation verification must be documented and approved. This includes installation, identification labeling, insulation, and all other requirements for placing systems into dynamic operation.
- 11
- 12
- 13 B. Required submittal documentation shall be present and located convenient to testing area. Validate that all required documentation has been submitted and is per the contract requirements.
- 14
- 15 C. Contractor shall provide the completed installation verification procedures at the time of testing. CA shall review the installation verification procedure documentation and spot-check at the beginning of Start-Up.
- 16
- 17 D. Contractor shall demonstrate that access is sufficient to perform required maintenance.
- 18 E. System and equipment configurations shall be compared against the contract documents.
- 19

3.02. START-UP CHECKS

- 21 A. All equipment, components, and devices applicable to the FPT must be started, and the Start-Up must be documented and approved. This includes completion of Start-Up Procedures, pressure testing (of equipment, duct and piping), flushing/cleaning, identification labeling, insulation, and all other requirements for placing systems into dynamic operation.
- 22
- 23
- 24
- 25 B. Unless specifically agreed to by the Owner and CA, all support systems shall be complete prior to FPT. For instance, an air handler will require that:
 - 27 1. The electrical system serving it is completed and tested.
 - 28 2. The hydronic systems serving it have been pressure tested, flushed, and functional performance tested.
 - 29 3. Balancing has been completed.
 - 30 4. The control systems have been started and calibrated.
 - 31 5. The CA shall determine the optimal sequence of testing.
- 32 C. Required submittal documentation shall be present and located convenient to testing area. Validate that all required documentation has been submitted and is per the contract requirements.
- 33
- 34 D. Contractor shall provide the completed Start-Up Procedures at the time of testing. CA shall review the Start-Up Procedure documentation and spot-check at the beginning of FPT.
- 35
- 36 E. Contractor shall demonstrate that access is sufficient to perform required maintenance.
- 37 F. BAS trends shall have been established as required in the documents. These shall generally be reviewed prior to or during FPT.
- 38
- 39 G. Capacities and adjusted/balanced conditions as applicable shall be subject to review.
- 40 H. Sequencing Verification: For applicable systems and equipment, all modes of operation shall be verified for proper sequencing.
- 41
- 42 I. System and equipment configurations shall be compared against the contract documents.
- 43 J. Verify Modes (such as heating and cooling) are coordinated and do not overlap or 'fight'.
- 44 K. All adjusted, balanced, controlled systems shall be assessed to determine the optimal setting for the system as applicable. The optimal settings should be determined to establish reliable, efficient, safe and stable operation.
- 45
- 46 L. BAS or Local Panel Dynamic Graphics: The graphic displays for all components, systems, and areas required to be represented by a graphic shall be checked for adequacy and accuracy. Furthermore, when setpoints or other parameters are required to be adjustable, CA shall verify that they can be adjusted directly from the graphic screen.
- 47
- 48
- 49

3.03. START-UP PROCEDURE

- 51 A. Purpose: The Commissioning process requires that the normal quality control processes involved with preparing systems and equipment for operation are performed to a high standard of care and are thoroughly documented. The required commissioning-related Start-Up Procedures involve nothing additional over that which would be done for a proper installation. These procedures shall be performed on all installed systems and equipment and no sampling strategy is used for the start-up process. The Commissioning process requires all Parties to collaborate to establish the optimal standard of care for starting systems and equipment. After the procedures are established, the Contractor performs them and documents them with the Start-up Procedures that are developed by the Contractor.
- 52
- 53
- 54
- 55
- 56
- 57
- 58

- 1 B. Start-Up Procedures: The content of these Start-Up Procedures shall provide the minimally acceptable content in
- 2 accordance with the OEM field quality control requirements. These procedures and protocols will normally be
- 3 common across different manufacturers.
- 4 C. Content of Start-Up Procedures: Start-Up Procedures shall generally include the following for each item of
- 5 equipment or system (as applicable):
- 6 1. Project-specific designation, location and service.
- 7 2. Indication of the Party performing and documenting the Start-Up Procedure.
- 8 3. Clear explanation of the inspection, test, measurement, and outcome with a Pass/Fail indication and a
- 9 record of measure parameters.
- 10 4. A Start-up Checklist item indicating that proper maintenance clearances have been maintained.
- 11 D. Recording and Documentation of Factory Start-Up: Manufacturer's start-up protocols shall be executed and forms
- 12 shall be completed by a qualified/authorized technician.
- 13 E. Recording and Documentation of non-Factory Start-Up: The start-up tests and checklists shall be completed by a
- 14 qualified technician.
- 15 F. Commissioning Provider Review: CA will review and spot-check procedures during FPT.
- 16 G. Documentation Completion: The individual executing the start-up must complete the start-up and pre-functional
- 17 documentation for any given equipment and acknowledge acceptability with the indication of who did the
- 18 associated task.
- 19 H. Sampling and Final Submission: All (100% of) systems are started and documented per the approved procedures
- 20 and NO sampling strategy is used. Completed Start-up and pre-functional checklists for all pieces of equipment
- 21 associated with independent systems shall be submitted to CA prior to any associated FPT. Any outstanding item
- 22 shall be clearly indicated and an associated Action Item must be entered to track resolution.
- 23 I. Owner Access: Contractor shall allow access by Owner representatives to inspect the equipment and ensure its
- 24 proper operation.

3.04 POINT TO POINT VERIFICATION

- 27 A. A documented, comprehensive point to point and basic function testing in the field is required on all installations.
- 28 Factory calibration and bench tests are not acceptable alternates to onsite field-testing.
- 29 B. Point-to-point (or calibration verification) scope of work consists of testing from all end field devices (any device
- 30 that provides an input signal to, or receives an output signal from the control hardware) through proper
- 31 input/output to the graphic and operator interface. Testing must be complete, detailed and documented on
- 32 approved point to point verification forms. Point-to-point should be performed with a separate device from the
- 33 installation sensor - "ringing out a sensor" alone is not an acceptable level point-to-point testing. Point-to-point
- 34 testing forms will include all point database requirements (i.e. alarm priority, paging, email, device range, etc.).
- 35 C. Submittal of the control provider's forms for approval must take place 3 weeks prior to commencement of field
- 36 testing. The point-to-point report summary documentation must include the signature of the test technicians and
- 37 date completed. The technician's signature certifies that the system has been tested and is fully ready for the
- 38 commissioning lead's performance verification testing.
- 39 D. The CA will select up to 10% of the readings from the BAS Reports and spot check them, as part of the time
- 40 allocations for the various systems. If subsequent failures are found, the Controls contractor will be required to
- 41 justify noted failures or re-verify and re-document the system.
- 42 E. The maximum failure rate for this sample is 10%. The readings selected by the CA may include air temperature,
- 43 fluid temperature, air flow rate, liquid flow rate, differential pressure, gage pressure, relative humidity, CO
- 44 concentration, CO2 concentration, and refrigerant monitoring.
- 45 F. For all readings a deviation of more than the below between the verification reading and reported data shall be
- 46 considered as failing the FPT

Sensor Application

Accepted BAS Tolerance

Airflow (Pressurized Spaces)	± 3 %
Airflow (Measuring Stations)	± 5 %
Airflow (Terminal)	± 10 %
Air Pressure Differential (Space)	± .001 in wg
Air Pressure (Ducts)	± .01 in wg
Air Relative Humidity	± 2 % RH

Air Temperature (Ducted)	± 1 deg F
Air Temperature (Room, AC unit, TU, etc.)	± 1 deg F
Air Temperature (Outside)	± 2 deg F
Air Wet Bulb Temperature Outdoor (Dew point)	± 2 deg F
Air Wet Bulb Temperature Indoor (Dew point)	± 1 deg F
Air Temperature Differential	± .25 deg F
Carbon Dioxide Monitor	± 50 PPM (of mid-range)
Carbon Monoxide Monitor	± 5 % (of mid-range)
Oxygen Monitor	± 5 %
Refrigerant Monitor	± 5 % (at 50 PPM)
Fluid Flow	± 5 %
Fluid Pressure	± 2 % (of full-scale)
Fluid Temperature	± 1 deg F
Electrical	± 5 %
Thermal Energy	± 5 %
Steam Flow	± 5 %
Steam Temperature	± 2 deg F
Vibration	± 5 %

1 ■Notes:

2 *Accepted calibration tolerances will vary according to measured medium and application of sensors. The tolerances*

3 *listed are standard accepted criteria.*

4 *Not all sensors listed above may be in the project.*

5

6 **3.05 TEST, ADJUST, AND BALANCE**

- 7 A. CA shall review TAB Plan, Draft / Final TAB reports.
- 8 B. The CA will select up to 10% of the readings from the Balancing Reports and spot check them, as part of the time
- 9 allocations for the various systems. If subsequent failures are found, the TAB contractor will be required to justify
- 10 noted failures or rebalance and re-document the system.
- 11 C. The maximum failure rate for this sample is 10%. The readings selected by the CA may include supply air diffuser
- 12 readings (both minimum and maximum readings for variable air volume boxes), main and branch supply duct
- 13 traverse readings, outside/return air flow readings, exhaust air flow readings, water flow readings, amp readings,
- 14 and water pressure drop readings through coils, heat exchangers, and other hydronic elements.
- 15 D. For all readings a deviation of more than 10% between the verification reading and reported data shall be
- 16 considered as failing the FPT.
- 17

18 **3.06 FUNCTIONAL PERFORMANCE TESTING**

- 19 A. Objectives and Scope:
- 20 1. The objective of FPT is to demonstrate that each system is operating according to the documented design
- 21 intent and Contract Documents. Functional testing facilitates bringing the systems from a state of
- 22 substantial completion to full dynamic operation. Additionally, during the testing process, areas of
- 23 deficient performance are identified and corrected, thus improving the function and operation of the
- 24 systems.
- 25 2. Each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up,
- 26 cool-down, normal [and emergency power], fire alarm, part- and full-load) where there is a specified
- 27 system response. Verifying each sequence in the sequences of operation is required. Proper responses to
- 28 such modes and conditions as power failure, freeze condition, no flow, equipment failure, etc. shall also be
- 29 tested.
- 30 B. Development of Test Procedures:
- 31 1. CA shall develop specific test procedures and forms to verify and document proper operation of each piece
- 32 of equipment and system. Prior to execution, the CA shall provide a copy of the test procedures to the

- 1 Contractor who shall review the tests for feasibility, safety, equipment and warranty protection, and scope.
2 The CA will also submit the tests to Owner for Review.
- 3 2. Contractor shall review the FPTs in detail and submit edits and comments to the CA for possible
4 incorporation.
- 5 3. The purpose of any given specific FPT is to verify and document compliance with the stated criteria of
6 acceptance, modes of operation and performance.
- 7 C. Scheduling: After Contractors' notification that systems are ready for testing and submittal and review of all the
8 required submittals has occurred, CM shall schedule the testing. To the extent practical, tests shall be scheduled
9 to allow efficient and contiguous testing of inter-related systems and equipment.
- 10 D. Phasing: Non-interdependent segments of the project testing can be phased. Phasing of this project will be
11 determined as the project progresses.
- 12 E. Participation: CA will direct, witness and document FPTs performed by the contractor after Start-Up Procedure
13 documentation of systems and equipment has been reviewed and accepted. CA will orchestrate the execution of
14 the FPTs unless otherwise specified. Contractor shall perform the FPTs as described in section 3.6 with
15 manipulation of the systems or equipment, provision of supporting equipment or materials (lifts, ladders, specialty
16 test equipment, safety equipment), and on-the-spot remediation of minor identified deficiencies whenever
17 possible.
- 18 1. Required participating Parties shall be indicated in the individual FPT. Typically, multiple Parties are
19 required for any given test, yet participation for any given Party is only required for the respective portion
20 of the test for which the Party is responsible.
- 21 2. Frequently, on multiple samples where a given party does not directly perform the test, the participation
22 of that party will only be required for an initial quantity of systems/equipment. Whenever practical and at
23 the discretion of the CA with the contractor's full approval, the CA will continue with the remaining portion
24 of the sample without assistance from the Contractor(s) not directly performing the test. However, the
25 Contractor is allowed to be present for any or all FPTs conducted.
- 26 3. The required parties shall be available on-site throughout the testing of any given system for which they
27 are required participants. Therefore, time for which they are not directly involved can be spent performing
28 other work (typically addressing identified punch list items or failed tests).
- 29 4. No party involved with the project is prohibited from participation in or witnessing of any tests. Any
30 Contractor may elect to witness all tests on their systems even if their involvement is not directly required
31 (for instance, BAS Vendor involvement is sometimes required on the first few of a sample and not on the
32 entire sample).
- 33 5. CA will endeavor to coordinate effectively with the individual Contractors throughout FPT and minimize
34 their required involvement.
- 35 F. Completeness: All systems must be completed and ready for FPT. All start up, factory authorized field testing,
36 independent testing agency tests, and TAB procedures must be complete and the control systems must be tested
37 and started for the respective system or component.
- 38 G. Test Documentation: CA will witness and document the tests. CA will record all test results on the forms developed
39 for the testing. CA will 'Pass' or 'Fail' the testing and record the date and time of the test. Deficiencies shall clearly
40 be indicated when the test is failed. When all related testing is completed successfully, CA shall recommend
41 acceptance of the system or component. In the case of specialized testing, witness (at CA's discretion) and review
42 the testing reports prepared by the Contractor.
- 43 H. After functional testing is completed all settings adjusted to test the equipment/system will be returned to normal.
- 44 I. FPT Acceptance:
- 45 1. The Acceptance Criteria shall be as follows unless specifically indicated within applicable individual
46 specification sections or test procedures. CA may exercise professional judgment to relax requirements
47 and pass tests and recommend approval by the Owner and Engineer when appropriate.
- 48 2. Accuracy/repeatability on sensing devices will be as specified for the device. CA and TAB will use calibrated
49 gages for independent validation and use judgment in passing or failing the devices. In many cases, the
50 coordination of multiple related sensors is more important than absolute accuracy.
- 51 3. HVAC sequence-related criteria will be as explicitly specified in the documents and as interpreted by the
52 CA.
- 53 4. Testing may be deferred due to seasonal or operational constraints. In either situation the testing will be
54 coordinated and be governed by the specifications for the project.
- 55 J. FPT Deficiencies:
- 56 1. Non-Conformance: Non-conformance deficiencies identified during FPT shall be resolved as follows:
- 57 a. The CA will record the results of the functional test. All deficiencies or non-conformance issues
58 shall be noted as Observation Log Items and reported to the Owner and CM.

- 1 b. Corrections of identified minor deficiencies may be made during the tests at the discretion of the
2 CA. In such cases the deficiency will be noted on the FPT documents.
- 3 c. Every effort will be made by the CA to expedite the testing process and minimize unnecessary
4 delays, while not compromising the integrity of the procedures.
- 5 d. As tests progress and deficiencies are identified, the CA will discuss the issue with the executing
6 Contractor.
- 7 e. When there is no dispute on the deficiency and the Contractor accepts responsibility to correct it:
8 i. The CA shall document the deficiency along with the Contractor's response and intentions,
9 and they go on to another test or sequence. A copy/email of the deficiency shall be
10 generated and provided to the Contractor and CA. The Contractor corrects the deficiency,
11 completes the Action Item response certifying that the issue is resolved and/or the
12 equipment is ready to be retested, and sends it back to the CA.
- 13 ii. The CA reschedules the test and the test is repeated.
- 14 f. If there is a dispute about a deficiency, regarding whether it is a deficiency and/or who is
15 responsible:
16 i. The deficiency shall be documented as an Observation Log Item with the Contractor's
17 response and the Owner and CM will be notified. The CM will track this issue under the
18 construction contract dispute resolution provisions.
- 19 ii. Final interpretive authority is with the A/E. Final acceptance authority is with the Owner
20 and CM.
- 21 iii. The CA documents the resolution to the Observation Log Item.
- 22 iv. Once the interpretation and resolution have been decided, the appropriate party corrects
23 the deficiency, and responds to the Action Item indicating completion. The CA reschedules
24 the test and the test is repeated until satisfactory performance is achieved. CA then closes
25 the Action Item.
- 26 K. Max Failure Limit and Sample Percentages: A Maximum Failure Limit is indicated along with the Sampling
27 Percentages. The Max Failure Limit indicates the maximum percentage of the tested devices that may have any
28 test that fails before an entirely new sample must be tested. This is based on the concept that if many failures
29 occur, it is a result of inadequate start-up by the Contractor. When the maximum number of failures is reached,
30 testing on that sample will be terminated and re-testing will be scheduled.
- 31 1. If no Max Failure Limit is indicated, all tested samples must pass (Max Failure Limit 0%).
- 32 2. Where sample tests involve multiple systems (i.e., checking strainers on different hydronic systems) the
33 Maximum Failure Limit will apply per system.
- 34 3. The responsible Contractors shall reimburse the Owner for the CA's cost of that sample test, and redo the
35 start-up and TAB for the applicable devices/systems.
- 36 4. All work necessitated by sample failures shall be at no cost to the Owner.
- 37 L. Failure Due to Manufacturer's Defects: If 10% of identical pieces of equipment fail to perform to the Contract
38 Documents (mechanically or substantively) due to manufacturing defect, all identical units may be considered
39 unacceptable by the CM. (For the purposes of defining 'identical equipment' for this Section, size or capacity alone
40 does not constitute a difference.) In case of failure due to manufacturer's defects, the Contractor shall provide
41 the Owner with the following:
42 1. Manufacturer's response in writing as to the cause of the failure and proposed resolution.
- 43 2. Manufacturer shall implement their proposed resolution on a representative sample of the product.
- 44 3. The CM will determine whether a replacement of all identical units or a repair is acceptable.
- 45 4. Upon acceptance, the manufacturer shall replace or repair all identical items at their expense and shall
46 extend the warranty accordingly (if the original equipment warranty had begun).
- 47 5. Manufacturer shall pay the costs of all retesting necessitated by the failure.
- 48
- 49 **3.07 ACCEPTANCE**
- 50 A. The CA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test
51 is made later after review by the CA and by the CM, if necessary. The CA recommends acceptance of each test to
52 the CM using a standard form. The CM gives final approval on each test using the same form, providing a signed
53 copy to the CA and the Contractor.
- 54
- 55 **3.08 CLOSEOUT**
- 56 A. Commissioning Report:

- 1 1. A final summary report (about four to six pages, not including backup documentation) by the CA will be
- 2 provided to the CM, focusing on evaluating commissioning process issues and identifying areas where the
- 3 process could be improved.
- 4 2. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved
- 5 issues, etc., will be compiled in appendices and provided with the summary report.
- 6 3. Installation verification, Start Up checklists, TAB, functional tests and monitoring reports will not be part of
- 7 the final report, but will be stored in the Commissioning Record in the I,O&M manuals.
- 8 4. Off season testing and additional factory start-ups shall clearly be identified and the designated test period
- 9 noted for contractor and owner coordination. See Warranty Period.
- 10 B. Code Required Reports:
- 11 1. Provide Contractor with all commissioning reports required by state and local authorities for compliance
- 12 with governing energy code and mechanical code.
- 13

3.09 TRAINING

- 14 A. Also Reference Section 01 79 00
- 15
- 16 B. The CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner
- 17 personnel for commissioned equipment.
- 18

3.10 INSTALLATION, OPERATION AND MAINTENANCE

- 19 A. Also Reference Section 01 78 23
- 20
- 21 B. Prior to substantial completion, the CA shall review the I,O&M manuals, documentation and redline as-builds for
- 22 systems that were commissioned to verify compliance with the Specifications. The CA will communicate
- 23 deficiencies in the manuals to the CM or A/E, as requested.
- 24 C. Upon a successful review of the corrections, the CA recommends approval and acceptance of these sections of the
- 25 O&M manuals to the CM or A/E.
- 26 D. The CA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are
- 27 clearly stated. This work does not supersede the A/E's review of the I,O&M manuals according to the A/E's
- 28 contract.
- 29

3.11 WARRANTY REVIEW

- 30 A. Also Reference Section 01 78 36
- 31
- 32 B. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's
- 33 design) shall be completed as part of this contract. The CA shall coordinate this activity. Tests will be executed,
- 34 documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CA witnessing. Any
- 35 final adjustments to the I,O&M manuals and as-builds due to the testing will be made.
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END OF SECTION

**SECTION 01 95 00
MEASUREMENT AND VERIFICATION**

PART 1 GENERAL

1.01 OVERVIEW

- A. This Measurement and Verification (M&V) plan is based on Option D: Calibrated Simulation of the *International Performance Measurement & Verification Protocol (IPMVP) Volume III: Concepts and Options for Determining Energy Savings in New Construction, April, 2003*. The plan is intended to verify the cost savings associated with energy efficiency measures incorporated into the design, and to provide a recalibrated energy model that will serve as a tool for building operators in identifying and remedying causes of underperformance.

1.02 SCOPE OF WORK

- A. McKinstry is primarily responsible for the M&V Plan's development, coordination and implementation. The project owner and building operations staff will support implementation of the plan
- B. A comprehensive measurement and verification plan will be developed which will detail the project milestones listed below:

Baseline energy model
Recalibrate baseline energy model to reflect as-built and post-occupancy conditions
Identification of ECMs for inclusion in the M&V plan
Development of M&V plan
Compilation of all occupancy, controls, BAS data, and scheduling information during the M&V period
Spot metering during M&V period
Installation of required sub-metering equipment
M&V Report
Corrective Action Plan (if necessary)

1.03 MEASUREMENT & VERIFICATION TEAM

- A. The measurement & verification team as referred to in all sections will consist of the job-specific group responsible for performing M&V duties throughout the project lifecycle. The primary point of contact is the project's performance assurance specialist at McKinstry.
- B. Additional parties crucial to the process but not directly responsible for Measurement & Verification in the capacity of those listed above are:
1. Mechanical Contractor Project Manager
 2. Mechanical Field Foremen
 3. Mechanical Design Engineer
 4. Control Contractor Representative
 5. Control Field Engineers / Technicians
 6. General Contractor Representative
 7. Electrical Contractor Representative
- C. The nature of the process requires a significant amount of communication between and participation of all members listed above.

1.04 MEASUREMENT & VERIFICATION PLAN

- A. Prior to project commencement the McKinstry team shall develop a comprehensive measurement & verification plan which will address the following:

1.05 INSTRUMENTATION

- A. All test instruments described in this section shall be acceptable for any portion of the measurement & verification process herein described. All instruments shall conform to the standards specified in the most recent edition of "International Performance Measurement and Verification Protocol (IPMVP)" regarding accuracy and calibration status. Current calibration certificates must be available.

- 1 B. Test instrument accuracy and resolution must match or exceed that of the system component being verified or
- 2 calibrated.
- 3 C. Test instruments must be used within guidelines as recommended by instrument manufacturer. All measuring
- 4 methods must be appropriate to the instrument application and measurements must be repeatable under
- 5 equivalent conditions.
- 6 D. The M&V team will use integrated, permanently-installed metering and BAS trending whenever feasible.
- 7 E. The M&V team shall assume full responsibility for safekeeping of all portable instrumentation during the course
- 8 of work.
- 9

10 PART 2 **PRODUCTS**
11 NOT USED

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15 PART 3 **EXECUTION**

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17 3.01 PRE-CONSTRUCTION

- 18 A. During the pre-construction phase, the measurement & verification team shall be available to all concerned
- 19 parties in a consulting capacity. The role of the team in the construction phase affords them with practical
- 20 knowledge that can be applied during the design and construction scheduling processes. Pre-construction input
- 21 is intended to reduce or eliminate issues that have historically hindered timely project completion or have
- 22 caused unanticipated project cost impact. Examples include:
- 23
 - 24 1. Engineering design issues.
 - 25 2. Manufacturer-specific equipment performance.
 - 26 3. System control strategies and metering equipment selection
 - 27 4. Subcontractor performance.
 - 28 5. Project scheduling conflicts.
 - 29 6. Owner / contractor expectations.

30 3.02 POST-INSTALLATION EQUIPMENT MONITORING

- 31 A. Following installation and before occupancy, commissioning activities were used to verify the proper
- 32 fundamental operations of the building systems. Should a component of an ECM fail to work in the designed
- 33 manner, maintenance will be performed to restore the equipment to its designed operation. Permanent and
- 34 spot metering will be used to measure electrical consumption. Operation staff will use metered trend data and
- 35 spot checks to identify underperforming systems so that corrective action can be taken.
- 36 B. The method of metering will be through sealed electronic sub meters, these meters will record the electrical
- 37 loads indicated within this plan. This project will require both electric submeters by building on campus as well
- 38 as heating and cooling system monitoring (temperature delta and flow metering) These meters are intended to
- 39 validate the anticipated energy savings previously indicated in LEED EAc1 and as indicated below. Recalibration
- 40 of the meters can be done by sending these meters back to the factory, contacts with these vendors have
- 41 indicated that this is typically done every five years. The table below shows the metering strategy that will be
- 42 used to monitor electrical loads.

43
44 3.03 M&V PERIOD VERIFICATION ACTIVITIES

- 45 A. On a monthly basis, operations staff shall record the energy consumption of loads associated with ECMs. Also
- 46 record any significant O&M activities performed on the systems during that time period, including any associated
- 47 costs. At the end of the one-year M&V period, summarize the electrical consumption data for comparison with
- 48 the recalibrated baseline and expected consumption. The metered equipment shall be inspected at the
- 49 conclusion of the M&V period and as needed to verify proper operation. All collected information and
- 50 comparison results will be included in the M&V report.
- 51 B. All efforts will be made to prevent the omission or loss of metered data. In the event that data is missing or lost,
- 52 existing data from before and after the missing portion will be used to extrapolate if appropriate. Extension of
- 53 the M&V period is also an option for mitigating the effect of lost data.

54
55 3.04 BUILDING AUTOMATION SYSTEM LOGGING/TRENDING

- 56 A. The schedule of point trends will be developed by McKinstry and shared with the project team upon project
- 57 execution and DDC system selection.

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- B. The BAS includes data logging functions that will also be used to provide ongoing measurement and verification data pertaining to certain mechanical systems. BAS data will be used in conjunction with metered electricity to track equipment performance, identify underperforming systems. This data will also be used to assist the baseline energy model recalibration. The table below shows the metering strategy that will be used to monitor mechanical systems that use electricity.

END OF SECTION

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SECTION 02 41 16

STRUCTURE DEMOLITION

PART 1 – GENERAL

- [1.1 RELATED DOCUMENTS](#)
- [1.2 SUMMARY](#)
- [1.3 DEFINITIONS](#)
- [1.4 MATERIALS OWNERSHIP](#)
- [1.5 INFORMATIONAL SUBMITTALS](#)
- [1.6 QUALITY ASSURANCE](#)
- [1.7 PROJECT CONDITIONS](#)
- [1.8 COORDINATION](#)

PART 2 – PRODUCTS

- [2.1 SOIL MATERIALS](#)

PART 3 – EXECUTION

- [3.1 EXAMINATION](#)
- [3.2 PREPARATION](#)
- [3.3 PROTECTION](#)
- [3.4 DEMOLITION, GENERAL](#)
- [3.5 DEMOLITION BY MECHANICAL MEANS](#)
- [3.6 SITE RESTORATION](#)
- [3.7 DISPOSAL OF DEMOLISHED MATERIALS](#)
- [3.8 CLEANING](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Demolishing the entire existing greenhouse structure.
 - 2. Removing below-grade construction.
 - 3. Disconnecting, capping or sealing, and abandoning in-place site utilities.
 - 4. Remove pipe sections within excavations.
- B. Related Sections:
 - 1. Section 01 50 00 "Temporary Facilities and Controls" for use of the premises and phasing requirements.
 - 2. Section 02 41 19 "Selective Demolition" for Owner salvage operations prior to demolition.
 - 3. Section 31 05 13 "Soils for Earthwork" for existing soils to be stockpiled for use.
 - 4. Section 31 1000 "Site Clearing and Removal" for related Work and requirements.
 - 5. Section 33 05 00 "Common Work Results for Utilities" for shutting off, disconnecting, removing, and sealing or capping utilities.

1.3 DEFINITIONS

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

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 INFORMATIONAL SUBMITTALS

- A. Schedule of Building Demolition Activities: Indicate the following:
 - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.
 - 2. Temporary interruption of utility services.
 - 3. Shutoff and capping or re-routing of utility services.
- B. Utility Demolition Record Drawings:
 - 1. Contractor shall be responsible for accurate record drawings indicating all utilities removed or utilities abandoned.
 - a. Show correct location of abandoned utility if incorrectly located on site plan.
 - b. Indicate sections of utilities abandoned in place, see Specification 01 78 39 As-Built Drawings, section 3.2 for surveying requirements of abandoned utilities.
 - c. Indicate sections of utilities removed
 - 2. Provide to Owner with other record drawings upon contract closeout

1.6 QUALITY ASSURANCE

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

1.7 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Owner assumes no responsibility for buildings and structures to be demolished.
 - 1. Owner shall remove all existing benching to include plant tables, CMU, and support materials prior to construction start work date.
 - 2. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Owner is pretesting areas of work for HAZMAT and will provide a detailed report of findings with Contract documents.
 - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
- D. On-site storage or sale of removed items or materials is not permitted.

1.8 COORDINATION

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

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Section 31 05 13 "Soils for Earthwork".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.

3.2 PREPARATION

- A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
- B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of demolition.

3.3 PROTECTION

- A. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
 - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.

3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated buildings completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 - 2. Maintain fire watch during and for at least 24 hours after flame cutting operations.
 - 3. Maintain adequate ventilation when using cutting torches.
- B. Explosives: Use of explosives is not permitted.

3.5 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
 - 1. Remove below-grade construction, including basements, foundation walls, and footings, completely.
- C. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

3.6 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site. See Section 01 74 19 "Construction Waste Management and Disposal" for recycling and disposal of demolition waste.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

3.8 CLEANING

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

END OF SECTION 02 41 16

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SECTION 02 41 19

SELECTIVE DEMOLITION AND OTHER OWNER SCOPE

PART 1 – GENERAL

- 1.1 [SUMMARY](#)
- 1.2 [MATERIALS OWNERSHIP](#)
- 1.3 [PREINSTALLATION MEETINGS](#)
- 1.4 [CLOSEOUT SUBMITTALS](#)
- 1.5 [QUALITY ASSURANCE](#)
- 1.6 [FIELD CONDITIONS](#)
- 1.7 [WORK BY OWNER.](#)
- 1.8 [WORK UNDER SEPARATE CONTRACTS.](#)
- 1.7 [WARRANTY](#)

PART 2 – PRODUCTS

- 2.1 [PERFORMANCE REQUIREMENTS](#)
- 2.2 [SELECTIVE DEMOLITION](#)

PART 3 – EXECUTION

- 3.1 [EXAMINATION](#)
- 3.2 [PREPARATION](#)
- 3.3 [UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS](#)
- 3.4 [PROTECTION](#)
- 3.5 [SELECTIVE DEMOLITION](#)
- 3.6 [CLEANING](#)

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.
 - 4. Work by Owner.
 - 5. Work under separate contracts.

1.2 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.

1.3 PREINSTALLATION MEETINGS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Engineering Survey: Submit engineering survey of condition of building.
- B. 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.
- C. Protection of indicated and identified historic materials. Submit proposed protection measures and procedures to protect historic materials during construction.
- D. Schedule of selective demolition activities with starting and ending dates for each activity.
- E. Statement of Refrigerant Recovery:

1.5 CLOSEOUT SUBMITTALS

- A. Inventory of items that have been removed and salvaged.

1.6 QUALITY ASSURANCE

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

- 1 **1.7 FIELD CONDITIONS**
- 2 A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- 3 1. Before selective demolition, Owner will remove the following items:
- 4 a. All existing benching to include plant tables, CMU, and support materials.
- 5 b. All loose interior furnishings and office equipment, art work, maintenance equipment, tools
- 6 and parts.
- 7 B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective
- 8 demolition.
- 9 C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
- 10 1. Owner is pretesting areas of work for HAZMAT and will provide a detailed report of findings with
- 11 Contract documents.
- 12 2. If materials suspected of containing hazardous materials are encountered, do not disturb;
- 13 immediately notify Architect and Owner.
- 14 D. Storage or sale of removed items or materials on-site is not permitted.
- 15 E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage
- 16 during selective demolition operations.

- 17 **1.8 WORK BY OWNER**
- 18 A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or
- 19 delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work
- 20 performed by Owner.
- 21 B. Preceding Work: Owner will perform the following construction operations within the construction zone at
- 22 Project site. Those operations are scheduled to be substantially complete before work under this Contract
- 23 begins.
- 24 1. Refer to C-Series and AD-Series drawings for locations and complete scope, which will generally
- 25 include the following:
- 26 a. Existing greenhouse plants, benches, loose equipment, trolleys, storage cabinets.
- 27 b. Existing garden benches, portable planters, landscape fencing, trash receptacles, landscape
- 28 light fixtures at grade, garden wayfinding signs.
- 29 c. Existing trees to be removed (excluding stump removal).
- 30 d. Small plants to be salvaged
- 31 C. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations
- 32 will be conducted simultaneously with Work under this Contract.
- 33 1. Owner will be preparing and planting the planting beds. Work to include placing top soil (contractor
- 34 to bring from stockpile), adding soil amendments, planting vegetation & trees, placing mulch,
- 35 watering.
- 36 2. Owner will be reinstalling other hardscape items removed by Owner.
- 37 D. Subsequent Work: Owner will perform the following additional work at site after Substantial Completion.
- 38 Completion of that work will depend on successful completion of preparatory Work under this Contract.
- 39 1. None anticipated.

- 40 **1.9 WORK UNDER SEPARATE CONTRACTS**
- 41 A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly,
- 42 without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this
- 43 Contract with work performed under separate contracts.
- 44 B. Preceding Work: Owner separate contract(s) for the following construction operations at Project site. Those
- 45 operations are scheduled to be substantially complete before Work under this Contract begins.
- 46 1. None anticipated.
- 47 C. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project
- 48 site. Those operations will be conducted simultaneously with work under this Contract.
- 49 1. Contractor(s) TBD to provide donor naming signage. Signage may include but not be limited to glass
- 50 etching, metal etching/engraving, relief signage mounted to walls, engraved pavers, etc.
- 51 2. Contractor(s) TBD to provide artistic opportunities to include but not be limited to mural paintings (in
- 52 the Learning Center Lobby (both floors), stairway, and corridor) and coat hanging features.
- 53 3. Contractor(s) TBD to deliver, setup/install furniture, carts, and similar equipment.
- 54 D. Subsequent Work: Owner separate contract(s) for the following additional work to be performed at site
- 55 following Substantial Completion. Completion of that work will depend on successful completion of
- 56 preparatory Work under this Contract.
- 57 1. None anticipated.

1 **1.10 WARRANTY**

- 2 A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during
3 selective demolition, by methods and with materials and using approved contractors so as not to void existing
4 warranties.

5 **PART 2 - PRODUCTS**

6 **2.1 PERFORMANCE REQUIREMENTS**

- 7 A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective
8 demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
9 B. Standards: Comply with ASSE A10.6 and NFPA 241.
10 C. Sustainable Design Requirements for Building Reuse:
11 1. Maintain existing building structure (including structural floor and roof decking) and envelope (exterior
12 skin and framing, excluding window assemblies and nonstructural roofing material) not indicated to
13 be demolished; do not demolish such existing construction beyond indicated limits.
14 2. Maintain existing interior nonstructural elements (interior walls, doors, floor coverings, and ceiling
15 systems) not indicated to be demolished; do not demolish such existing construction beyond
16 indicated limits.
17 3. Maintain existing nonshell, nonstructural components (walls, flooring, and ceilings) not indicated to
18 be demolished; do not demolish such existing construction beyond indicated limits.

19 **2.2 SELECTIVE DEMOLITION**

- 20 A. Scope of selective demolition, salvage and building elements to remain protected are indicated AD and C
21 series drawings.
22 B. Refer to Electrical Demolition drawings for removing all lighting, salvaging, cleaning, and storing fixtures to
23 be re-used.
24 C. Copper roofing panels:
25 1. Refer to Drawing Sheet A103 – Roof Plan.
26 2.

27 **PART 3 - EXECUTION**

28 **3.1 EXAMINATION**

- 29 A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
30 B. Perform an engineering survey of condition of building to determine whether removing any element might
31 result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during
32 selective building demolition operations.
33 C. Inventory and record the condition of items to be removed and salvaged.

34 **3.2 PREPARATION**

- 35 A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to
36 40 CFR 82 and regulations of authorities having jurisdiction.

37 **3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS**

- 38 A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them
39 against damage.
40 1. City will maintain the wireless access points and service in the existing building.
41 B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal
42 or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
43 1. Arrange to shut off utilities with utility companies.
44 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary
45 services/systems that bypass area of selective demolition and that maintain continuity of
46 services/systems to other parts of building.
47 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems,
48 equipment, and components indicated on Drawings to be removed.
49

- 1 **3.4 PROTECTION**
2 A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to
3 people and damage to adjacent buildings and facilities to remain.
4 B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to
5 preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and
6 to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
7 C. Remove temporary barricades and protections where hazards no longer exist.

- 8 **3.5 SELECTIVE DEMOLITION**
9 A. General: Demolish and remove existing construction only to the extent required by new construction and as
10 indicated. Use methods required to complete the Work within limitations of governing regulations and as
11 follows:
12 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods
13 least likely to damage construction to remain or adjoining construction. Use hand tools or small power
14 tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to
15 remain.
16 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing
17 finished surfaces.
18 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces,
19 such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-
20 cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
21 4. Maintain fire watch during and for at least 2 hours after flame-cutting operations.
22 5. Locate selective demolition equipment and remove debris and materials so as not to impose
23 excessive loads on supporting walls, floors, or framing.
24 6. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 74 19
25 "Construction Waste Management and Disposal."
26 B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure
27 minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
28 C. Removed and Salvaged Items:
29 1. Clean salvaged items.
30 2. Pack or crate items after cleaning. Identify contents of containers.
31 3. Store items in a secure area until delivery to Owner.
32 4. Prepare items for Owner's storage area.
33 D. Removed and Reinstalled Items:
34 1. Clean and repair items to functional condition adequate for intended reuse.
35 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
36 3. Protect items from damage during transport and storage.
37 E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during
38 selective demolition.

- 39 **3.6 CLEANING**
40 A. Remove demolition waste materials from Project site and recycle or dispose of them according to
41 Section 01 74 19 "Construction Waste Management and Disposal."
42 1. Do not allow demolished materials to accumulate on-site.
43 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
44 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey
45 debris to grade level in a controlled descent.
46 4. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and
47 Disposal."
48 B. Burning: Do not burn demolished materials.
49 C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition
50 operations. Return adjacent areas to condition existing before selective demolition operations began.

51 **END OF SECTION**

SECTION 03 10 00
CONCRETE FORMWORK

- 1
- 2
- 3 PART 1 – GENERAL
- 4 1.1 DESCRIPTION
- 5 1.2 QUALITY ASSURANCE
- 6 1.3 SUBMITTALS
- 7 1.4 DESIGN REQUIREMENTS
- 8 PART 2 – PRODUCTS
- 9 2.1 MATERIALS AND ACCESSORIES
- 10 2.2 FORM FINISHES
- 11 2.3 FABRICATION AND MANUFACTURE
- 12 PART 3 – EXECUTION
- 13 3.1 CONSTRUCTION OF TEMPORARY FORMWORK
- 14 3.2 COORDINATION
- 15 3.3 INSTALLATION OF EMBEDDED ITEMS
- 16 3.4 REMOVAL OF FORMS
- 17 3.5 FASTENER REMOVAL
- 18 3.6 REMOVING AND REUSING FORMS

19 PART 1 - GENERAL

20 1.1 DESCRIPTION

- 21 A. The General and Supplementary Conditions of the Construction Contract and Division 1 - General
- 22 Requirements apply to the work specified in this section.
- 23 B. This section includes the design, construction and treatment of formwork and related accessories to
- 24 confine and shape concrete to the required dimensions.
- 25 C. This section also includes the installation of embedded items such as waterstops, dovetail anchors,
- 26 flashing reglets, shelf angles, and PVC weeps.
- 27 D. Structural notes indicated on the drawings regarding concrete formwork shall be considered a part
- 28 of this specification.

29 1.2 QUALITY ASSURANCE

- 30 A. Codes and Standards: Comply with the provisions of the following codes, specifications, and
- 31 standards except where more stringent requirements are shown or specified.
- 32 1. ACI 117 – Standard Specification for Tolerances for Concrete Construction and Materials.
- 33 2. ACI 301 – Standard Specification for Structural Concrete.
- 34 3. ACI 318 – Building Code Requirements for Structural Concrete.
- 35 4. ASTM C31 – Standard Specification for Making and Curing Concrete Test Specimens in
- 36 the Field.
- 37 5. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Test
- 38 Specimens.
- 39 B. Where provisions of the pertinent Codes and Standards conflict with this specification, the more
- 40 stringent provision shall govern.

1 **1.3 SUBMITTALS**

- 2 A. Formwork Release Agent: Submit data on the formwork release agent proposed for use with each
3 form surface to be used for acceptance unless otherwise specified in the Contract Documents.
4 Include certification that agent is compatible with finish.
- 5 B. Product Data: Submit manufacturer's product data for all waterstop profiles supplied for the concrete
6 construction.
- 7 C. Testing for Formwork Removal: When methods other than cylinder tests are proposed for
8 determining time for formwork removal, submit data on methods for approval.
- 9 D. Construction Joints: Submit layout of construction joints and details of construction joints.

10 **1.4 DESIGN REQUIREMENTS**

- 11 A. Design and Engineering of formwork is the responsibility of the Contractor. Design and construct
12 formwork, shoring and bracing to conform to Contract Documents and building code requirements.
13 Design for construction loads, lateral pressure, and requirements of the applicable building code.
- 14 B. Drawings show the design requirements and dimensions for structural strength, but structural
15 drawings do not show all detail dimensions to fit intricate Architectural and mechanical detail.
16 Contractor shall so construct the concrete work that it will conform to the clearance required by the
17 Architectural, Mechanical and Electrical design.
- 18 C. Maximum deflection of facing materials forming concrete surfaces exposed to view shall be 1/240 of
19 the center-to-center span between structural members of the formwork.

20 **PART 2 - PRODUCTS**

21 **2.1 MATERIALS AND ACCESSORIES**

- 22 A. Formwork Accessories: Use commercially manufactured accessories for formwork accessories that
23 are partially or completely embedded in concrete, including ties and hangers.
- 24 B. Formwork Release Agent: Use commercially manufactured form release agents that will prevent
25 formwork absorption of moisture, prevent bond with concrete, and will not stain the concrete surface.
26 Formwork release agent shall be compatible with paint or any other finish applied to the concrete;
27 submit data indicating compatibility.
- 28 C. Bentonite Waterstops: Waterstops shall be a flexible butyl rubber and bentonite clay compound that
29 swells upon contact with water. Acceptable manufacturer's and products:
- 30 1. CETCO – Waterstop RX
31 2. Greenstreak – Swellstop
32 3. J.P. Specialties – Earth Shield (Type 20 & 23) Waterstop
- 33 D. PVC Waterstops: Waterstop materials shall be non-metallic polyvinyl chloride (PVC) or thermoplastic
34 elastomeric rubber (TPE-R) material.
- 35 1. Waterstop shall be fabricated from prime virgin resin material.
- 36 2. PVC material shall meet Corp of Engineers CRD – C572. TPE-Rubber shall meet EPA Title
37 40 CFR Section 265.193.
- 38 3. Profile shall be 6 inches long, multi-ribbed, center bulb type with 3/16 inch minimum
39 thickness.

- 1 4. Splices shall be field welded butt splices as recommended by the manufacturer. Provide
2 shop made fittings for all changes in directions and intersections, which maintain continuity
3 of the waterstop profile. All splices shall provide not less than 80% tensile strength of the
4 parent section. Edge welding is not permitted.
- 5 5. Acceptable manufacturer's and products:
- 6 a. Greenstreak. – PVC Waterstop
7 b. J.P. Specialties – Earth Shield (TPE–Rubber) Waterstop
8 c. Westec Barrier Technologies – TPE–R Waterstop
- 9 E. Form Material:
- 10 1. No aluminum shall be allowed in the concrete work unless coated to prevent aluminum-
11 concrete reaction.
- 12 2. Concrete form materials must be used in a manner so as to provide the surface finish
13 specified.
- 14 3. Design formwork in accordance with the provisions of the building code or the following
15 standards if not covered in the building code:
- 16 a. Wood - AF & PA "National Design Specification".
17 b. Plywood - American Plywood Association "Plywood Design Specification".
18 c. Steel - AISC "Manual of Steel Construction - Allowable Stress Design".
19 d. Cold-formed Steel - AISI "Cold-Formed Steel Design Manual".
20 e. Aluminum - Aluminum Association "Aluminum Construction Manual".
21 f. Concrete - ACI 318.
22 g. Other materials - as directed by manufacturer.
- 23 F. Chamfer Strips:
- 24 1. Chamfer strips shall be 3/4 inch by 3/4 inch strips. Verify material finish with Architect.
- 25 **2.2 FORM FINISHES**
- 26 A. Rough Form Finish:
- 27 1. Concrete surfaces not exposed to view in the finished work shall have a rough-form finish.
28 No form-facing material is specified for rough-form finish.
- 29 2. Set and maintain forms so finished concrete dimensions shall conform to the tolerances.
30 Rough form finish is Designated Surface Finish-1.0 from ACI 301, except that surface
31 tolerance Class C is required as specified in ACI 117.
- 32 B. Smooth Form Finish:
- 33 1. Concrete surfaces exposed to view in the finished work or surfaces to receive finishes of
34 any type (paint, textured paint, etc.) shall have a smooth form finish. Form-facing material
35 shall be plywood, tempered concrete-form-grade hardboard, metal, plastic, paper, or other
36 acceptable material capable of producing the desired finish. Form-facing material shall
37 produce a smooth, uniform texture on the concrete. Do not use form facing material with
38 raised grain, torn surfaces, worn edges, patches, dents, or other defects that might impair
39 the texture of the concrete surfaces.
- 40 2. Set and maintain forms so finished concrete dimensions shall conform to the tolerances.
41 Smooth form finish is Designated Surface Finish-3.0 from ACI 301, including surface
42 tolerance Class A as specified in ACI 117.
- 43 C. Patching and repairing concrete finishes are specified under Section 03 30 00.

1 **2.3 FABRICATION AND MANUFACTURE**

- 2 A. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties
3 designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on
4 removal.
- 5 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of the
6 exposed concrete surface.
- 7 2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in
8 concrete surface.
- 9 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or
10 waterproofing.
- 11 B. Waterstops: Fabricate pieces of premolded waterstop with a maximum practicable length to hold the
12 number of end joints to a minimum. Fabricate joints in waterstops in accordance with manufacturer's
13 recommendations.

14 **PART 3 - EXECUTION**

15 **3.1 CONSTRUCTION OF TEMPORARY FORMWORK**

- 16 A. Design, erect, shore, brace, and maintain formwork to support vertical, lateral, static, and dynamic
17 loads, and construction loads that might be applied, until concrete structure can support such loads.
- 18 B. At construction joints, lap contact surface of the form sheathing for flush surfaces exposed to view
19 over the hardened concrete in the previous placement by not more than 1 inch. Ensure formwork is
20 held firmly against hardened concrete to prevent offsets or loss of mortar at construction joints and
21 to maintain a true surface.
- 22 C. Provide watertight formwork when Architectural exposed concrete is specified.
- 23 D. Unless specified in the Contract Documents, construct formwork so concrete surfaces conform to
24 tolerance limits. The class of surface for offset between adjacent pieces of formwork facing material
25 shall be Class C, unless specified otherwise.
- 26 E. Provide positive means of adjustment (wedges or jacks) of shores and struts. Do not make
27 adjustments in the formwork after concrete has taken its initial set. Brace formwork securely against
28 lateral deflection and lateral instability.
- 29 F. To maintain specified tolerances, camber formwork to compensate for anticipated deflections in
30 formwork prior to hardening of concrete. Formwork camber calculations are the responsibility of the
31 formwork designer. Set formwork and intermediate screed strips for slabs accurately to produce
32 designated elevations and contours of the finished surface prior to removal of formwork. Ensure that
33 edge forms and screed strips are sufficiently strong to support vibrating screeds or roller pipe screeds
34 when the finish specified requires the use of such equipment.
- 35 G. When formwork is cambered, set screeds to a like camber to maintain required concrete thickness.
- 36 H. Fasten form wedges in place after final adjustment of forms and prior to concrete placement.
- 37 I. Anchor formwork to shores, supporting surfaces, or members to prevent upward or lateral movement
38 of the formwork system during concrete placement.
- 39 J. Securely brace and shore forms to prevent displacement and to safely support construction loads.
- 40 K. Construct formwork for wall openings to facilitate removal and to counteract swelling of wood
41 formwork. Keep wood forms wet as necessary to prevent shrinkage.

- 1 L. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide
2 crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for
3 inclined surfaces steeper than 1.5 horizontal to 1 vertical. Chamfer wood inserts for forming keyways,
4 reglets, recesses, and the like, for easy removal.
- 5 M. Do not use rust-stained steel form-facing material.
- 6 N. Provide temporary openings at the base of column and wall formwork and at other points where
7 necessary to facilitate cleaning and inspection.
- 8 O. Unless noted otherwise, all footings shall be centered under walls, piers or columns.
- 9 P. Provide runways for moving equipment and support runways directly on formwork or structural
10 member without resting on the reinforcing steel.
- 11 Q. Place sleeves, inserts, anchors, and embedded items required for adjoining work or for support of
12 adjoining work prior to concrete placement.
- 13 R. Position and support expansion joint material and other embedded items to prevent displacement.
14 Fill voids in sleeves, inserts, and anchor slots temporarily with readily removable material to prevent
15 entry of concrete into voids.
- 16 S. Projecting corners of beams, walls and columns shall be formed with a 3/4 inch chamfer. Unless
17 noted otherwise on Architectural drawings.
- 18 T. Clean surfaces of formwork and embedded materials of mortar, grout, and foreign material before
19 concrete is placed.
- 20 U. Cover surfaces of formwork with acceptable formwork release agent. Apply form release agent
21 before placing reinforcing steel and concrete according to manufacturer's written instructions. Do
22 not allow formwork release agent to puddle in forms. Do not allow formwork release agent to contact
23 reinforcing steel or hardened concrete against which fresh concrete is to be placed
- 24 V. Clean and inspect formwork immediately before concrete is placed.
- 25 W. Provide forms for concrete work adjacent to earth banks including sides of footings, except where
26 footing excavation is vertical rock cut.
- 27 X. Construct forms plumb and straight to conform to slopes, lines and dimensions shown.
- 28 Y. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations
29 and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use
30 strike-off templates or compacting-type screeds.

31 **3.2 COORDINATION**

- 32 A. Install all required pipe sleeves, cavities or slots. Notify appropriate trades in due time so that they
33 may furnish information and make necessary installations. Check sizes, location and alignment of
34 all openings, frames and other work, which are to be built-in including electrical boxes and conduit.
- 35 B. Layout the run of partitions and establish location of openings so that other trades may properly
36 locate their work.
- 37 C. Core drilling concrete is not permitted unless noted otherwise or approved in writing by the Architect.
38 Notify the Architect in advance of conditions not shown on the drawings.

1 **3.3 INSTALLATION OF EMBEDDED ITEMS**

2 A. Built-In Items:

- 3 1. Confirm with Architect that all materials to be embedded are suitable for embedment in
4 concrete.
- 5 2. Build in anchors, inserts, and other devices indicated or required for various portions of
6 work.
- 7 3. Build in sleeves, thimbles, and other items furnished or set in place by other trades.
- 8 4. Accurately position and support all embedded items prior to concrete placement. Secure
9 embedded items against displacement during concrete placement operations.
- 10 5. Fill voids with readily removable material to prevent entry of concrete into voids.
- 11 6. Mechanical and electrical shall provide and set required sleeves.
- 12 7. Coordinate setting of all embedded items.

13 B. Waterstops:

- 14 1. Locate waterstops in joints where indicated on the Drawings.
- 15 2. Build in waterstops using longest unbroken lengths possible to hold the number of end
16 splices to a minimum.
- 17 3. Form splices and intersections strictly according to the manufacturer's instructions so that
18 waterstops are continuous and develop effective watertight joint.
- 19 4. Locate bentonite waterstops as shown on the Drawings. In general, waterstops should be
20 located just behind outermost layer of reinforcing. Do not place waterstops closer than 2"
21 from face of concrete.
- 22 5. Center PVC waterstops in joints. Take care to prevent waterstops from bending over during
23 placing of concrete. Provide waterstops at all locations indicated on the Drawings.

24 **3.4 REMOVAL OF FORMS**

25 A. When removal of formwork is based on concrete reaching a specified compressive strength, concrete
26 will be presumed to have reached this strength when either of the following requirements has been
27 met:

- 28 1. Test cylinders, molded and cured under the same conditions for moisture and temperature
29 as used for the concrete they represent, have reached the specified compressive strength.
- 30 2. Concrete has been cured in accordance with the specifications for the same length of time
31 as laboratory-cured cylinders, which have reached the specified strength. Determine the
32 length of time concrete has been cured in the structure by the cumulative number of days
33 or fractions thereof, not necessarily consecutive, during which the temperature of the air in
34 contact with the concrete is above 50 degrees and the concrete has been damp or
35 thoroughly sealed from evaporation and loss of moisture.

36 B. Forms shall remain in place for the following periods of time. These periods represent cumulative
37 number days or hours, not necessarily consecutive, during which the temperature of the air
38 surrounding the concrete is above 50 F:

- 39 1. Walls and footings: 50% specified compressive strength or minimum 24 hours.
- 40 2. One-way slabs at grade: 75% specified compressive strength.

- 1 C. When finishing is required, remove forms as soon as removal operations will not damage concrete.
- 2 D. Loosen wood formwork for wall openings when this can be accomplished without causing damage
3 to concrete.
- 4 E. Do not allow removal of formwork to damage the fresh concrete for columns, walls, sides of beams,
5 and other parts supporting the weight of the concrete. Perform needed repair and treatment required
6 on vertical surfaces at once and follow immediately with specified curing.

7 **3.5 FASTENER REMOVAL**

- 8 A. Remove all protruding fasteners left as a result of securing inserts to forms by Contractor responsible
9 for insert.
- 10 B. Cutting flush with surface is not acceptable.
- 11 C. Patch exposed concrete surfaces if damaged during fastener removal process.

12 **3.6 REMOVING AND REUSING FORMS**

- 13 A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise
14 damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release
15 agent.
- 16 B. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align
17 and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless
18 approved by Architect

19 **END OF SECTION**

SECTION 03 20 00
CONCRETE REINFORCEMENT

1
2
3 PART 1 – GENERAL
4 1.1 DESCRIPTION
5 1.2 QUALITY ASSURANCE
6 1.3 SUBMITTALS
7 1.4 COORDINATION
8 1.5 PRODUCT DELIVERY, STORAGE AND HANDLING
9 PART 2 – PRODUCTS
10 2.1 MATERIALS
11 2.2 FABRICATION
12 PART 3 – EXECUTION
13 3.1 PLACING

14 **PART 1 - GENERAL**

15 **1.1 DESCRIPTION**

- 16 A. The General and Supplementary Conditions of the Construction Contract and Division 1 - General
17 Requirements apply to the work specified in this section.
- 18 B. This section includes the fabrication and placement of reinforcing steel for concrete, and all related
19 accessories.
- 20 C. Reinforcing steel for use in bond beams, masonry columns, and lintels is specified in Division 4 and
21 is not a part of the work in this section.
- 22 D. Structural notes indicated on the drawings regarding concrete reinforcement shall be considered a
23 part of this specification.

24 **1.2 QUALITY ASSURANCE**

- 25 A. Codes and Standards: Comply with the provisions of the following codes, specifications and
26 standards, except where more stringent requirements are shown or specified.
- 27 1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
- 28 2. ACI 301 - Standard Specification for Structural Concrete.
- 29 3. ACI 318 - Building Code Requirements for Structural Concrete.
- 30 4. ACI 315 - Details and Detailing of Concrete Reinforcement.
- 31 5. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
- 32 6. ASTM A184 - Standard Specification for Welded Deformed Steel Bar Mats for Concrete
33 Reinforcement.
- 34 7. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for
35 Concrete.
- 36 8. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for
37 Concrete Reinforcement.
- 38 9. AWS D1.4 - Structural Welding Code - Reinforcing Steel.
- 39 10. CRSI - Manual of Standard Practice.

1 B. Where provisions of other pertinent codes and standards conflict with this specification, the more
2 stringent provision shall govern.

3 **1.3 SUBMITTALS**

4 A. Placing Drawings: Submit placing drawings showing fabrication dimensions and locations for
5 placement of reinforcement and reinforcement accessories. Indicate bar sizes, spacing, locations,
6 and quantities of reinforcing steel, bending and cutting diagrams, and supporting and spacing
7 devices. Dowels shall be shown in placing drawings for the element that is to be placed first.
8 Reinforcing steel descriptions or shop drawings shall be inch-pound sizes.

9 B. Manufacturer's Certificate: Submit mill certifications at time of delivery.

10 C. Splices: Submit request for splices not indicated in the Contract Documents. Request shall indicate
11 locations, types, and lengths of splices for approval.

12 D. Field Bending: Submit requests and procedure for field bending or straightening of reinforcement
13 partially embedded in concrete not described in the Contract Documents.

14 E. Reinforcement Relocation: Submit requests to adjust reinforcement spacing necessitated by conflicts
15 with other reinforcement, conduits, etc. for approval.

16 **1.4 COORDINATION**

17 A. Coordinate reinforcement installation with the placement of formwork and other embedded items
18 such as inserts, conduit, pipe sleeves, drains, metal supports, anchor rods, etc.

19 **1.5 PRODUCT DELIVERY, STORAGE AND HANDLING**

20 A. Deliver reinforcement to the jobsite in bundles sorted and labeled with durable tags indicating bar
21 size, length, and shop drawing mark.

22 B. Store elevated clear of ground and protect at all times from contamination and deterioration.

23 C. Prevent bending, coating with earth, oil, or other material, or otherwise damaging the reinforcement.

24 **PART 2 - PRODUCTS**

25 **2.1 MATERIALS**

26 A. Bar Deformations: Bars used for reinforcement shall be deformed except column spirals and welded
27 wire reinforcement, which may be plain.

28 B. Reinforcing Steel: Reinforcing steel shall conform to the ASTM standard and grade indicated in the
29 General Notes on the Drawings.

30 C. Welded Wire Reinforcement: Welded wire reinforcement shall conform to the ASTM standard
31 indicated in the General Notes on the Drawings.

32 D. Joint Dowel Bars: Plain-steel bars. Cut bars true to length with square ends and free of burrs.

33 E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening
34 reinforcing bars and welded wire reinforcement in place. Manufacture bar supports according to
35 CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced
36 concrete of greater compressive strength than concrete, and as follows:

37 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use
38 CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.

- 1 2. Concrete cast against earth: Bars may be supported by precast concrete bricks or approved
2 prefabricated wire bar supports with footpads large enough to support the weight of the bars
3 and construction traffic without being pushed into underlying grade. Precast concrete blocks
4 shall have a minimum compressive strength of 6,000 psi.
- 5 F. Epoxy Anchoring System: Epoxy anchoring shall consist of a reinforcing dowel and the epoxy
6 adhesive cartridge.
- 7 1. Reinforcing shall be as specified earlier in this Section.
- 8 2. Epoxy injection gel shall consist of a two-component structural epoxy adhesive applied in a
9 dual cartridge dispensing system, which properly mixes the components at the point of
10 application. Refer to General Notes for acceptable epoxy anchoring systems.

11 **2.2 FABRICATION**

- 12 A. Fabrication Tolerances: Reinforcing steel shall be shop fabricated within tolerances to conform in
13 size, shape, quantity, dimensions, etc. to the Construction Drawings and approved Shop Drawings.
- 14 B. Bar Condition: Bars shall be free from mill scale, excessive rust and other coatings, which would
15 reduce or destroy the bond with the concrete.
- 16 C. Bars Bending: Bars shall be bent cold, and no method of fabrication shall be used which would be
17 injurious to the material. Heating of bars for bending is not permitted.
- 18 D. Identification: After fabrication, bars shall be sorted, bundled and tagged with metal tags bearing the
19 bar mark before delivery to the jobsite.
- 20 E. Corner Bars: Provide corner bars to make reinforcing continuous at all times, including intersections
21 at footings, walls, beams or caps. Such bars shall be the same size and spacing as the horizontal
22 reinforcing and each leg shall have a length of at least 30 inches.
- 23 F. Reinforcing for continuous footings shall extend into spread footings a minimum of 2'-0".
- 24 G. Dowels between footings and walls or columns shall be the same grade, size and spacing or number
25 as the vertical reinforcing respectively, unless noted otherwise.

26 **PART 3 - EXECUTION**

27 **3.1 PLACING**

- 28 A. Reinforcement Relocation: When necessary to move reinforcement beyond the specified spacing to
29 avoid interference with other reinforcement, or embedded items, submit resulting arrangement of
30 reinforcement to Engineer for approval.
- 31 B. Reinforcement Cutting: Cutting of reinforcement which conflicts with embedded objects is not
32 acceptable.
- 33 C. Welded Wire Reinforcement: Extend welded wire reinforcement to within 1 inch of the concrete edge.
34 Lap edges and ends of fabric sheets a minimum of one full mesh square plus 2". Support welded
35 wire reinforcement during placing of concrete to assure required positioning in the slab. Do not place
36 wire reinforcement on grade or metal deck and raise into position in freshly-placed concrete.
- 37 D. Wire Tie Orientation: Set wire ties so that ends are directed away from concrete surface.
- 38 E. Slab on Grade Reinforcement Placement: Place shrinkage and temperature reinforcement 2 inches
39 from the top surface of the slabs on grade unless noted otherwise on the Drawings.
- 40 F. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing
41 concrete.

- 1 G. Support for Reinforcement: Unless noted otherwise, supports for reinforcement shall have Class 2
2 protection as defined in the CRSI Manual of Standard Practice. Submit data on supports indicating
3 class of protection at all different locations for approval.
- 4 H. Support for Bars in Concrete Cast on Ground: Bar supports for slabs on grade, grade beams,
5 footings, and all other concrete cast directly onto grade shall be supported at an average spacing of
6 4 feet or less in each direction.
- 7 I. Securing Reinforcing Bars: All bars must be placed, spaced, secured and supported prior to casting
8 concrete. Bars embedded in hardened or partially hardened concrete shall not be bent unless
9 approved in writing prior to placement by the Engineer of Record.
- 10 J. Foot Traffic: Restrict foot traffic over the slab on grade reinforcing after it has been properly
11 positioned.
- 12 K. Reinforcement at Expansion Joints: Do not continue reinforcement or other embedded metal items
13 bonded to concrete through expansion joints. Dowels bonded on only one side of a joint and
14 waterstops may extend through joint.
- 15 L. Pumping Concrete: When using a pump to place concrete, pump hose shall be supported directly on
16 forms. Do not allow hose to rest on reinforcing bars if doing so could cause displacement of bars.

17 **END OF SECTION**

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

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32 **PART 1 - GENERAL**

33 **1.1 DESCRIPTION**

- 34 A. The General and Supplementary Conditions of the Construction Contract and Division 1 - General
- 35 Requirements apply to the work specified in this section.

- 36 B. The work includes all items required for executing and completing the cast-in-place concrete work
- 37 and related work shown on the drawings or specified herein. Work shall include installation of items
- 38 furnished in other sections of these specifications.

- 39 C. Concrete paving, walks, and curbs are specified in Division 3 or 32.

- 40 D. Structural notes indicated on the drawings regarding Cast-In-Place concrete shall be considered a
- 41 part of this specification.

42 **1.2 QUALITY ASSURANCE**

- 43 A. Codes and Standards: Comply with the provisions of the following codes, specifications, and
- 44 standards, except where more stringent requirements are shown or specified herein:

- 45 1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
- 46 2. ACI 301 - Standard Specifications for Structural Concrete
- 47 3. ACI 303.1 - Standard Specification for Cast-in-Place Architectural Concrete
- 48 4. ACI 305.1 - Specification for Hot Weather Concreting

- 1 5. ACI 306.1 - Standard Specification for Cold-Weather Concrete
- 2 6. ACI 318 - Building Code Requirements for Reinforced Concrete.
- 3 7. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the
4 Field.
- 5 8. ASTM C33 - Standard Specification for Concrete Aggregates.
- 6 9. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete
7 Specimens.
- 8 10. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed
9 Beams of Concrete.
- 10 11. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
- 11 12. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
- 12 13. ASTM C150 - Standard Specification for Portland Cement.
- 13 14. ASTM C157 - Standard Test Method for Length Change of Hardened Hydraulic-Cement
14 Mortar and Concrete
- 15 15. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
- 16 16. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
- 17 17. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the
18 Volumetric Method.
- 19 18. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the
20 Pressure Method.
- 21 19. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
- 22 20. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing
23 Concrete.
- 24 21. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
- 25 22. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural
26 Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
- 27 23. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing
28 Flowing Concrete.
- 29 24. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Portland Cement
30 Concrete.
- 31 25. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete
32 Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- 33 26. ASTM D1751 - Standard Specification for Preformed Expansion Joint Fillers for Concrete
34 Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- 35 27. ASTM E154 - Standard Test Method for Water Vapor Retarders Used in Contact with Earth
36 Under Concrete Slabs, on Walls, or as Ground Cover.
- 37 28. ASTM E329 -Standard Specification for Agencies Engaged in Testing and/or Inspection of
38 Material Used in Construction

- 1 29. Concrete Reinforcing Steel Institute (CRSI) - Manual of Standard Practice.
- 2 B. Comply with all local building code requirements which are more stringent than those listed above.
- 3 All referenced codes or standards shall be the most currently adopted as of the date for Receipt of
- 4 Proposal.
- 5 C. Where any provision of other pertinent codes and standards conflict with this specification, the more
- 6 stringent provision shall govern.
- 7 D. Maintain records verifying materials used are of the specified and accepted types and sizes and are
- 8 in conformance with the requirements of the Contract Documents.
- 9 E. Use of testing services will not relieve the Contractor of the responsibility to furnish materials and
- 10 construction in full compliance with the Contract Documents.

11 **1.3 TESTING AND INSPECTION**

- 12 A. Inspection and Testing:
- 13 1. The Owner shall employ an Inspection Agency to perform the duties and responsibilities
- 14 specified below.
- 15 2. Refer to architectural, civil, mechanical, and electrical specifications for testing and
- 16 inspection requirements of non-structural components.
- 17 3. Work performed on the premises of a fabricator approved by the building official need not
- 18 be tested and inspected per the table below. The fabricator shall submit a certificate of
- 19 compliance that the work has been performed in accordance with the approved plans and
- 20 specification to the building official and the Architect and Engineer of Record.
- 21 4. Duties of the Inspection Agency:
- 22 a. Perform all testing and inspection required per the Testing and Inspection
- 23 Schedule indicated below.
- 24 b. Furnish inspection reports to the building official, the Owner, the Architect, the
- 25 Engineer of Record, and the General Contractor. The reports shall be completed
- 26 and furnished within 48 hours of inspected work.
- 27 c. Submit a final signed report stating whether the work requiring Inspection was, to
- 28 the best of the Inspection Agency's knowledge in conformance with the approved
- 29 plans and specifications.
- 30 5. Structural Component Testing and Inspection Schedule for Section 03 30 00 is as follows:

	Continuous	Periodic	Referenced Standard
Concrete and Concrete Placement			
Review of proposed mix design and supporting test results		X	
Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased or where strength design is used.	X		ACI 318: 8.1.3, 21.2.8
Inspection of anchors installed in hardened concrete.		X	ACI 318: 3.8.6, 8.1.3, 21.1.8

Concrete and Concrete Placement	Continuous	Periodic	Referenced Standard
Verifying use of required design mix		X	ACI 318: Ch. 4, 5.2-5.4
At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X		ASTM C172, ASTM C31, ACI 318: 5.6, 5.8
Inspection of concrete placement for proper application techniques	X		ACI 318: 5.9, 5.10
Inspection for maintenance of specified curing temperature and techniques.		X	ACI 318: 5.11 - 5.13
Verification of in-situ concrete strength, prior to removal of shores and forms from beams and structural slabs		X	ACI 318: 6.2

- 1 B. Sampling and testing requirements:
- 2 1. Take samples of fresh concrete at the job site for each mix design placed each day.
- 3 Sampling and testing shall be done after the final addition and proper mixing of any water
- 4 or admixtures that are added on site.
- 5 a. Personnel and testing equipment shall meet the requirements of ASTM E329.
- 6 b. Testing Frequency: Obtain at least one composite sample for each 150 cu. yd. or
- 7 5,000 sq. ft. of surface area, whichever is less or fraction thereof of each concrete
- 8 mixture placed each day.
- 9 1) On a given project, if the total volume of concrete is such that the
- 10 frequency of testing required above would provide less than five strength
- 11 tests for a given class of concrete, tests shall be made from at least five
- 12 randomly selected batches or from each batch if fewer than five batches
- 13 are used.
- 14 c. A strength test shall be the average of the strengths of two cylinders made from
- 15 the same sample of concrete and tested at 28 days.
- 16 2. For each sample of fresh concrete, perform the following duties:
- 17 a. Measure and record slump in accordance with ASTM C143.
- 18 b. Measure and record temperature in accordance with ASTM C1064.
- 19 1) Provide one test hourly when air temperature is 40°F (4.4°C) and below
- 20 and when 80°F (27°C) and above, and one test for each composite
- 21 sample.
- 22 c. Measure and record air content by volume in accordance with either ASTM C231
- 23 or ASTM C173.

- 1 d. Mold three cylinders (laboratory cylinders) in accordance with ASTM C31 to be
2 laboratory-cured. Protect from moisture loss and maintain at 60°F to 80°F for 24
3 to 48 hours before moving. Deliver cylinders to testing laboratory for curing and
4 testing.
- 5 e. Mold one cylinder (field cylinder) in accordance with ASTM C31 to be field-cured.
6 Field cylinder shall be placed as near as possible to the in-place concrete from
7 which it was taken, protected, and cured in the same manner. Deliver field-cured
8 cylinder to testing laboratory, and measure and record compressive strength in
9 accordance with ASTM C39. Field cylinder shall be used to determine if concrete
10 footings, walls, or piers have reached the required compressive strength for steel
11 erection to begin.
- 12 3. Measure and record compressive strength in accordance with ASTM C39 for laboratory
13 cylinders. Test one laboratory cylinder at 7 days and all other cylinders at 28 days.
14 Acceptance is based on the average of the two laboratory cured 28-day tests. Notify
15 Architect in the event strength levels do not meet the acceptance requirements of ACI 318.
- 16 a. Any additional cylinders molded for Contractor to have a compressive strength test
17 done before seven days shall be at the Contractor's expense.
- 18 4. Prepare and submit test reports to the Architect, Engineer, Contractor, and Supplier.
19 Reports shall be completed and furnished within 48 hours of testing. Refer to description in
20 Submittals.
- 21 5. When strength of field-cured cylinders is less than 85 percent of companion laboratory-
22 cured cylinders, Contractor shall evaluate operations and provide corrective procedures for
23 protecting and curing in-place concrete.

24 **1.4 SUBMITTALS**

- 25 A. Concrete Materials: Submit information on concrete materials as listed below.
- 26 1. Cementitious materials: Submit type, class, producer name, and certification not more than
27 90 days old of compliance with applicable ASTM standard.
- 28 2. Aggregates: Submit type, pit or quarry location, producer name, gradations, specific gravity,
29 water content, and certification not more than 90 days old.
- 30 3. Admixtures: Submit product data sheet. Product data shall include: dosages and
31 performance data, brand names, producers, chloride ion concentrations, and certifications
32 of compliance with applicable ASTM standard. Certifications shall not be more than 90 days
33 old.
- 34 4. Water: Submit name of source.
- 35 B. Product Data: Prepare and submit product and performance data for materials and accessories,
36 including patching compounds, waterstops, joint systems, curing compounds, finish materials and
37 other concrete related items.
- 38 C. Testing Agency Qualifications: When requested, the proposed testing agencies shall submit data on
39 qualifications for acceptance.
- 40 D. Concrete Mix Design:
- 41 1. Concrete mix design submittals shall be submitted at least 14 days prior to placing concrete.

- 1 2. Submit concrete mixture proportions and characteristics for each concrete mix. Include
2 standard deviation analysis or trial batch data with mix design. Submit historical field test
3 data to demonstrate the average compressive strength for approval. Concrete mix
4 proportions, materials, and handling methods for field test data or trial batches shall be the
5 same as used for the work. Include the following information for each mix design:
- 6 a. Water/cementitious materials ratio.
7 b. Slump per ASTM C143
8 c. Air content per ASTM C231 or ASTM C173
9 d. Unit weight of concrete per ASTM C138
10 e. Compressive strength at 28 days per ASTM C39
- 11 3. If trial batches are used, submit representative samples of each proposed ingredient to
12 independent testing laboratory for use in preparation of mix design.
- 13 4. Include alternate mix designs when characteristics of materials, project conditions, weather,
14 test results, or other circumstances warrant adjustments. Indicate amounts of mix water to
15 be withheld for later addition at Project site.
- 16 5. Provide a record copy of the final mix designs and test results to the testing agency prior to
17 commencement of the concrete work.
- 18 E. Concrete Finish Shop Drawings: Submit drawings indicating type of finish to be used at each location.
- 19 F. Slab-on-Grade Joint Layout: Submit drawings for proposed slab-on-grade control joint and
20 construction joint layout for approval.
- 21 G. Test Reports: Submit laboratory test reports for concrete materials, mix design, compressive
22 strength, slump, air content, and temperature. Each report shall indicate date of sampling, date of
23 test, mix design, and location of concrete in structure.
- 24 H. Repair Methods: When stains, rust, efflorescence, and surface deposits must be removed, submit
25 the proposed method of removal.
- 26 I. Certificates: Submit written certification regarding the design mix from the ready-mix supplier and
27 the admixture manufacturer stating all concrete and admixtures do not contain chloride ions in excess
28 of concentrations specified herein.
- 29 J. Placement Notification: Notify the Architect at least 24 hours in advance of concrete placement.
- 30 K. Adjustments: Submit any adjustments to mixture proportions or changes in materials, suppliers, or
31 sources along with supporting documentation during the course of the work.
- 32 L. Cold Weather Procedure Submittal: Refer to Cold Weather Concreting article in Part 3 for more
33 information.
- 34 **1.5 MATERIAL DELIVERY, STORAGE, AND HANDLING**
- 35 A. Cementitious materials: Store cementitious materials in dry weather tight buildings, bins, or silos that
36 exclude contaminants.
- 37 B. Aggregates: Store and handle aggregate in a manner that will avoid segregation and prevent
38 contamination with other materials or other sizes of aggregates. Store aggregates so as to drain
39 freely.
- 40 C. Admixtures: Protect stored admixtures against contamination, evaporation, or damage. Protect liquid
41 admixtures from freezing and temperature changes, which would adversely affect their performance.
42 Handle chemical admixtures in accordance with manufacturer's instructions.

1 **PART 2 - PRODUCTS**

2 **2.1 CONCRETE MATERIALS**

3 A. Portland Cement: Portland cement shall conform to ASTM C150, Type I Normal, and be a standard
4 brand of Portland cement. Use one brand of cement throughout project, unless approved in writing
5 by the Engineer. Cement, which conforms to ASTM C150 Type II, may be used if it also meets the
6 requirements of ASTM C150 Type I. Cement used in concrete shall be of the same brand and type
7 as the cement used in the concrete represented by the submitted field test data or used in the trial
8 mixtures. Maintain consistent cement color throughout project unless directed otherwise by
9 architectural requirements.

10 1. Total replacement of Portland cement by supplementary cementitious materials in design
11 mixture shall not exceed 50% (by weight).

12 B. Supplementary Cementitious Materials

13 1. Fly Ash: Fly ash shall conform to ASTM C618, Class C or Class F. Replacement of Portland
14 cement by fly ash shall not exceed the following (percentages are by weight):

- 15 a. Concrete Flatwork: 20 percent.
16 b. Mass Concrete (more than two feet thick): 50 percent.
17 c. All other concrete: 25 percent.
18 d. Concrete to be placed in cold weather as defined herein: No fly ash allowed unless
19 the cold weather procedure submitted has compensated for the increased setting
20 time and decreased rate of strength gain due to cold weather and fly ash.

21 2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

22 a. Ground Granulated Blast-Furnace Slab Limit: 50% by weight of total cementitious
23 materials.

24 b. In mass concrete more than 2 feet thick, the usage rate may be 80% by weight of
25 total cementitious materials.

26 3. Combined Fly Ash and Ground Granulated Blast-Furnace Slag:

27 a. Supplementary Cementitious Materials Limit: 50% with fly ash not exceeding 25%
28 by weight of total cementitious materials.

29 b. In mass concrete more than 2 feet thick: 80% with fly ash not exceeding 50% by
30 weight of total cementitious materials.

31 C. Blended Hydraulic Cements

32 1. Portland Blast-Furnace Slag Cement: ASTM C 595, Type IS.

33 a. Blast-Furnace Slag Content: 25% to 50% by weight of total cementitious materials.

34 2. Portland-Pozzolan Cement: ASTM C 595, Type IP.

35 a. Pozzolan Content: 15% to 40% by weight of Pozzolan total cementitious materials.

36 3. Pozzolan-Modified Portland Cement: ASTM C 595, Type I (PM).

37 a. Pozzolan Content: 0% to 15% by weight of total cementitious materials.

38 4. Slag-Modified Portland Cement: ASTM C 595, Type I (SM).

39 a. Blast-Furnace Slag Content: 0% to 25% by weight of total cementitious materials.

- 1 D. Coarse Aggregate for Normal Weight Concrete: Comply with ASTM C33. Provide coarse aggregate
2 from a single source for exposed concrete. Gradations shall be similar to that described in the
3 following table:

COARSE AGGREGATE GRADATIONS							
SIEVE SIZE - PERCENT PASSING							
Grade No.	1-1/2"	1"	3/4"	1/2"	3/8"	No. 4	No. 16
4	90-100 Note 1	20-55	0-15	---	0-5		---
57	100	95-100	---	25-60	0-10	0-10	---
67		100	90-100	---	20-55	0-10	---
89	---	---	---	100	90-100	20-55	0-10

- 4 1. Shall be 100 percent passing the 2" sieve.
- 5 2. A maximum of 30% of coarse aggregate may be recycled aggregate for footing and grade
6 beam concrete.
- 7 E. Fine Aggregate for Normal Weight Concrete: Comply with ASTM C33. Provide fine aggregate from
8 a single source for exposed concrete. Fine aggregate shall consist of washed sand. Gradations shall
9 be similar to that described in the following table:

FINE AGGREGATE GRADATIONS							
SIEVE SIZE - PERCENT PASSING							
Grade No.	3/8	No. 4	No. 8	No. 16	No. 50	No. 80	No. 100
FA	100	95-100	80-100	50-85	5-30	---	0-10

- 10 1. A maximum of 10% of fine aggregate may be recycled aggregate for footing and grade
11 beam concrete.
- 12 F. Do not use aggregates containing deleterious substances that could cause spalling on any exterior
13 exposed surface. These include, but are not limited to the following:
- 14 1. Organic impurities.
15 2. Ferrous metals.
16 3. Soluble salts.
17 4. Coal, lignite, or other lightweight materials.
18 5. Soft particles.
19 6. Clay lumps and friable particles.
20 7. Cherts of less than 2.40 specific gravity.
- 21 G. Water: Mixing water for concrete shall meet the requirements of ASTM C94. Water shall be clean
22 and free from injurious amounts of acids, alkalis, organic materials, chloride ions and oils deleterious
23 to concrete or reinforcing steel.
- 24 H. Testing agency shall be given access to plants and stockpiles to obtain samples for testing for
25 compliance with the Contract Documents.

1 **2.2 ADMIXTURES**

2 A. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other
3 admixtures. Calcium chloride thiocyanates or admixtures containing more than 0.05 percent chloride
4 ions by weight are not permitted.

5 B. Water Reducing Admixture: Material shall comply with ASTM C494, Type A. Acceptable
6 manufacturers and products include:

- 7 1. Euclid Chemical Company - Eucon WR Series.
- 8 2. Sika Chemical Corp. - Plastocrete 161.
- 9 3. GRT – Polychem 400 NC.
- 10 4. Grace Construction Products - WRDA 82.

11 C. High Range Water Reducing Admixture (superplasticizer): Material shall comply with ASTM C494,
12 Type F or Type G. Acceptable manufacturers and products include:

- 13 1. Euclid Chemical Company - Eucon 37 or Plastol Series.
- 14 2. Sika – ViscoCrete 2100.
- 15 3. GRT – Melchem.
- 16 4. Grace Construction Products - Mira 110.

17 D. High Range Water Reducing, Slump Retaining Admixture: Material shall comply with ASTM C494,
18 Type F or Type G. Acceptable manufacturers and products include:

- 19 1. Euclid Chemical Company - Eucon 537, Eucon 1037, or Plastol Series.
- 20 2. Sika – Sikament 686.
- 21 3. GRT – Melchem – M.
- 22 4. Grace Construction Products – ADVA FLEX.

23 E. Non-Chloride Accelerator: Material shall comply with ASTM C494, Type C or Type E, and not contain
24 a higher chloride ion concentration than municipal drinking water. Acceptable manufacturers and
25 products include:

- 26 1. Euclid Chemical Company - Accelguard Series.
- 27 2. Sika Chemical Corp. - Sika Rapid-1.
- 28 3. GRT – Polychem HE.
- 29 4. Grace Construction Products – Lubricon NCA.

30 F. Air Entraining Admixture: Air entraining admixture shall comply with ASTM C260, and be certified by
31 the manufacturer to be compatible with other admixtures to be used. Acceptable manufacturers and
32 products include:

- 33 1. Euclid Chemical Company - Air-Mix or AEA Series.
- 34 2. Sika Chemical Corporation - Sika-Aer.
- 35 3. GRT – Polychem VR.
- 36 4. Grace Construction Products - Darex II or Daravair 1000.

37 G. Hydrophilic Crystalline Waterproofing Admixture (Required at Underground Cistern): Concrete
38 waterproofing system shall be of the crystalline type that chemically controls and permanently fixes
39 a non-soluble crystalline structure within the pores and capillary tracts of the concrete. The system
40 shall cause the concrete to become sealed against the penetration of liquids from any direction, and
41 shall protect the concrete from deterioration due to harsh environmental conditions. Acceptable
42 manufacturers and products include:

- 43 1. Xypex or approved equivalent.

44 H. Admixtures used in concrete shall be the same brand, type, and dosage used in concrete represented
45 by field test data or used in trial mixes.

1 **2.3 CURING PRODUCTS**

2 A. Moisture Retaining Cover

3 1. Plastic Film: Use 6 mil polyethylene film sheet materials that meet the requirements of
4 ASTM C171.

5 2. White burlap-polyethylene sheet meeting ASTM C171.

6 3. Reinforced Curing Paper complying with ASTM C171.

7 4. Moisture Retaining Fabric: A naturally colored, non-woven, polypropylene fabric with a 4-
8 mil, non-perforated reflective (white) polyethylene coating containing stabilizers to resist
9 degradation from ultraviolet light. Fabric shall exhibit low permeability and high moisture
10 retention. Acceptable manufacturers and products include:

11 a. PNA Construction Technologies, Inc.: Hydracure M15.

12 b. Reef Industries Incorporated: Transguard 4000.

13 B. Dissipating Resin Curing Compound: Clear, waterborne, membrane-forming curing compound
14 complying with ASTM C309, Type 1, Class B shall be composed of hydrocarbon resins and
15 dissipating agents that begin to break down upon exposure to ultraviolet light and traffic
16 approximately 4 to 6 weeks after application, providing a film that is removable with standard
17 degreasing agents, and mechanized scrubbing actions so as to not impair the later addition of applied
18 finishes.

19 1. Curing compounds used on interior enclosed environments shall be a water-borne product
20 and VOC compliant as required by the U.S. EPA Architectural Coating Rule.

21 C. Non-dissipating Curing Compound: Clear, membrane-forming curing compound complying with
22 ASTM C309, Type 1, Class B.

23 1. Curing compounds used on interior enclosed environments shall be a water-borne product
24 and VOC compliant as required by the U.S. EPA Architectural Coating Rule.

25 D. Curing and Sealing Compound: Clear, membrane-forming curing and sealing compound complying
26 with ASTM C309, Type 1, and ASTM C1315, Type 1, Class A. Compound shall dry to a clear finish,
27 resist yellowing due to ultraviolet degradation and provide a long lasting finish that has high
28 resistance to chemicals, oil, grease, deicing salts, and abrasion.

29 1. Curing and sealing compounds used on interior enclosed environments shall be a water-
30 borne product and VOC compliant as required by the U.S. EPA Architectural Coating Rule.

31 **2.4 MISCELLANEOUS MATERIALS**

32 A. Patching Mortar: Non-shrink, non-slump, non-metallic, quick setting. Acceptable manufacturers and
33 products:

34 1. Euclid Chemical Company - Eucospeed.

35 2. BASF - Thorite.

36 3. Adhesive Technologies. - Hard Rok Vertipatch.

37 4. W.R. Meadows - Speed Crete (Red Line).

38 5. Dayton Superior – Re-Crete 20 minute.

39 6. SpecChem - Precast Patch.

40 B. Expansion Joint Material: Preformed, resilient, non-extruding asphalt impregnated resilient fiber
41 conforming to ASTM D1751. Thickness of expansion joint material shall be 1/2" unless noted
42 otherwise on the drawings.

- 1 C. Magnesium phosphate patching cement specially designed for cold weather grouting and anchoring.
2 Acceptable Manufacturer:
- 3 1. BASF - MasterEmaco T545.
4 2. Euclid Chemical Company - Eucospeed MP.
- 5 D. Vapor Retarder: ASTM E 1745, Class A, not less than 10 mils (0.25 mm) thick. Acceptable
6 manufacturers and products:
- 7 1. Stego Industries, LLC - Stego Wrap.
8 2. W.R. Meadows, Inc. - Perminator.
9 3. Raven Industries - Vapor Block
10 4. Insulation Solutions - Viper VaporCheck II.
- 11 E. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or
12 silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and
13 densifies concrete surfaces. Acceptable manufacturers and products:
- 14 1. Conspec Marketing & Manufacturing Co., Inc. - Intraseal
15 2. Curecrete Chemical Co., Inc. - Ashford Formula
16 3. Dayton Superior Corporation - Day-Chem Sure Hard (J-17)
17 4. Euclid Chemical Company - Eucosil
18 5. L&M Construction Chemicals, Inc. - Seal Hard
19 6. Vexcon Chemicals, Inc - Vexcon Starseal PS
20 7. SpecChem - SpecHard
- 21 F. Control Joint Filler: Flexible, single-component polyurethane sealant with backer rod compliant with
22 ASTM C 920, Type S, Grade P, Class 25. Apply sealant per manufacturers written
23 recommendations. Acceptable manufacturers and products:
- 24 1. Dayton Superior – Perma 230 SL.
25 2. Euclid Chemical Company – Eucolastic I.
26 3. Sonneborn – Sonolastic SL 1.

27 **2.5 STRENGTH AND PROPERTIES**

- 28 A. Concrete Mix Designs: Refer to Drawings for specified compressive strength. Proportion concrete
29 mixes according to the properties in the following tables. The concrete supplier may produce a mix
30 at a lower water-cement ratio to allow for adjustment of slump at the site by adding water. The addition
31 of site water shall be in accordance with ASTM C94, and the total water-cement ratio shall not exceed
32 the value specified below.

Class	Coarse Aggregate Gradation	Fine Aggregate Gradation	Range of Slump	Max. w/c	Air Content	Other Requirements
A	57 or 67	FA	1" to 4"	0.40	5% to 8%	
B	57 or 67	FA	1" to 4"	0.45	5% to 8%	
C	57 or 67	FA	1" to 4"	0.50	—	
D	57 or 67	FA	4" to 6"	0.50	—	Use water reducing admixture to achieve slump specified
E	4 or 57	FA	1" to 4"	0.50	—	
F	4 or 57	FA	5" to 8"	0.50	—	Use retarder

Class	Coarse Aggregate Gradation	Fine Aggregate Gradation	Range of Slump	Max. w/c	Air Content	Other Requirements
H	89	FA	5" to 8"	0.50	—	
J	Lightweight	FA	5" max	0.5	4% to 7%	Maximum 107-116 pcf dry density

1 Note: w/c = water-cementitious materials ratio.

2 B. Schedule of Concrete Classes: Provide concrete of the specified class according to the following
3 schedule.

- 4 1. Footings: Class E
5 2. Exterior foundation walls and piers: Class B
6 3. Interior piers: Class C
7 4. Interior slabs on grade: Class D
8 5. Interior slab on metal decks: Class D
9 6. Floor topping: Class H
10 7. Unless noted otherwise: Class B

11 C. Slump of Superplasticized Concrete: Concrete containing high-range water reducing admixtures
12 (superplasticizer) shall have 8" maximum slump, unless otherwise approved by Structural Engineer.
13 Concrete shall arrive at job site with 2" to 3" slump, be verified, then high range water reducing
14 admixture added to increase slump to approved level.

15 D. Accelerators: Add non-chloride accelerator to all concrete slabs placed at air temperatures below
16 50°F.

17 E. Water Reducer: Add water reducing admixture or high range water reducing admixtures
18 (superplasticizers) as follows:

- 19 1. All pumped concrete.
20 2. Fiber reinforced concrete.
21 3. As required for placement or workability.
22 4. As required by high temperatures, low humidity, or other adverse placement conditions.
23 5. Concrete with water-cementitious materials ratio below 0.50.

24 F. No other admixtures shall be used unless approved by Structural Engineer of record.

25 G. Chlorides: Admixtures or other ingredients including aggregates containing calcium chloride or more
26 than 0.05% chloride ions by weight shall not be used.

27 H. Workability: Concrete shall have a workability such that it will fill the forms without voids,
28 honeycombs, or rock pockets with proper vibration without permitting materials to separate or excess
29 water to collect on the surface.

30 I. Concrete Temperatures: Minimum concrete temperature of fresh concrete varies in relation to
31 average air temperature over a 24-hour period as follows:

- | | |
|------------------------------------|--------------------------------|
| 32 1. Air temperature below 0°F | Concrete temperature 70°F min. |
| 33 2. Air temperature 0°F to 30°F | Concrete temperature 65°F min. |
| 34 3. Air temperature 30°F to 50°F | Concrete temperature 50°F min. |
| 35 4. Air temperature above 50°F | No minimum temperature |

36 The maximum temperature of concrete at the time of delivery shall be 90°F. When concrete
37 temperature exceeds 90°F, concrete supplier shall attempt to reduce temperature by shading
38 aggregates and cement and cooling mix water. When these methods fail to reduce concrete
39 temperature below 90°F, supplier shall use ice in the water to reduce the concrete temperature.

1 **PART 3 - EXECUTION**

2 **3.1 PREPARATION**

- 3 A. Do not place concrete until data on materials and mix designs have been approved, Architect has
4 been notified, and all other affected trades have coordinated their work.
- 5 B. Remove snow, ice, frost, water, mud, and other foreign material from surfaces, reinforcing bars and
6 embedded items against which concrete will be placed.
- 7 C. Do not allow form release agent to contact reinforcing bars.
- 8 D. Sandblast all existing concrete surfaces older than 28 days against which concrete is to be placed,
9 unless directed otherwise in writing by Architect/Engineer.

10 **3.2 SLABS**

- 11 A. Slab on Grade:
- 12 1. All interior slabs on grades shall have a polyethylene vapor retarder conforming to ASTM
13 E1745. Lap all joints minimum 6" and seal edges with adhesive tape. Fit vapor retarder
14 around utilities and seal with adhesive tape as required. Place, protect, and repair vapor-
15 retarder sheets according to ASTM E 1643 and manufacturer's written instructions.
- 16 2. Refer to Drawings and Section 31 23 00 for required sub-grade preparation beneath slabs
17 on grade.
- 18 3. Where vapor retarder is not used below slab on grade, wet sub-grade below slab prior to
19 placing concrete. Subgrade shall be moist with no free water and no muddy or soft spots.
- 20 4. Saw cut control joints: Cut with power saws equipped with shatterproof abrasive or
21 diamond-rimmed blades. Cut joints into concrete when cutting action will not tear, abrade,
22 or otherwise damage surface and before concrete develops random contraction cracks.
23 Control joints shall be located along column lines, with intermediate joints spaced at a
24 maximum distance of 36 times the slab thickness, unless noted otherwise. Control Joints
25 shall be continuous, not staggered or offset. Slab panels shall have a maximum length to
26 width ratio of 1.5 to 1. Provide additional control joints at all reentrant or isolated corners
27 formed in the slab on grade. Refer to Drawings for typical control joint detail.
- 28 5. Provide isolation joints around each column and along foundation walls. Form isolation
29 joints with 1/2" expansion joint material. Extend isolation joint material full width and
30 depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
- 31 6. Depress slabs as required for mats architectural finishes, pits and kitchen equipment.
32 Obtain layout and locations from Architect.
- 33 7. Verify completion of all under slab work with mechanical and electrical trades before placing
34 slabs.
- 35 8. Slope slabs as indicated on Drawings and to provide positive drainage. Slope slab keeping
36 bottom level and varying top. Maintain minimum thickness of concrete as indicated on
37 Drawings. Refer to floor finishes for tolerances.
- 38 B. All slabs not on grade (all supported slabs), including slabs-on-steel decking and cast-in-place
39 concrete slabs:
- 40 1. Supported slabs have deflections that may cause areas of concrete to have thicknesses
41 greater than indicated on the Drawings. Contractor is expected to provide that volume as
42 needed to finish the floor at the specified elevation. If specified floor finish tolerances are
43 not achieved during the concrete floor construction, the Contractor shall install, at no cost

1 to the project, a self-leveling cementitious underlayment (Master Builders Mastertop 110
2 Underlayment or approved equal) to correct the floor flatness and levelness.

3 C. Embedded Items:

4 1. The outside diameter of embedded conduit or pipe shall not exceed one-third of the slab
5 thickness in structural slabs, including at crossovers, and shall be placed between the top
6 and bottom reinforcing with a minimum 3" clear cover. Conduit or pipe running parallel to
7 each other shall be spaced at least 8" apart and no more than 2 runs stacked vertically in
8 the slab. Conduit or pipe shall not be embedded in any supported slab less than 6" thick.
9 No embedded conduit or pipe is allowed in any concrete slab-on-steel deck.

10 3.3 CONSTRUCTION JOINTS

11 A. Construction Sequence Submittal: Contractor shall submit a construction sequence indicating
12 construction joints and the pour sequence.

13 B. Vertical: Locate vertical construction joints in walls not farther than a maximum of 100 feet on center.
14 Coordinate joint locations with architectural design.

15 C. Horizontal: Locate horizontal joints in walls, piers and columns at underside of slabs and at the top
16 of slabs and footings unless otherwise indicated. At least 24 hours shall elapse between placing
17 concrete in a wall, beam or column and placing concrete in an area supported by the walls, beams
18 or columns, unless approved in writing by Structural Engineer.

19 D. Reinforcing: Stop all welded wire reinforcement and/or reinforcing at construction joint in slabs on
20 grade and provide dowel bars as detailed. Provide reinforcement at other construction joints as
21 detailed. Roughen and thoroughly clean the surface of the concrete, remove all laitance, and wet the
22 surface before placing new concrete against the joint. Slush vertical joints with a neat cement grout
23 before placing new concrete.

24 E. Wall Control Joints: Locate vertical control joints in exposed walls at a minimum uniform spacing not
25 to exceed 25 feet-0 inches. Coordinate joint locations with Architectural Drawings.

26 3.4 CONCRETE PLACEMENT

27 A. Place concrete as continuously as possible until placement is complete. Do not place against
28 concrete that has attained initial set, except at authorized joints. If, for any reason, concrete pour is
29 delayed for more than 45 minutes, bulkhead off pour at last acceptable construction joint.
30 Immediately remove excess concrete and clean forms.

31 B. Do not begin to place concrete during periods of rain, sleet or snow unless adequate protection is
32 provided.

33 C. No concrete shall be cast onto or against sub-grades containing free water, frost, ice or snow.

34 D. Notify the architect in advance if concrete is to be pumped.

35 E. Do not place concrete until all reinforcement is in place, forms have been thoroughly cleaned and
36 approval has been given.

37 F. Do not accept concrete delivered to the job site more than 90 minutes after initial mixing.

38 G. Concrete from its point of release to mixers, hoppers, or conveyances, shall not be permitted to drop
39 more than 5 feet (10 feet for concrete containing high range water reducers). Deposit concrete
40 directly into conveyances and directly from conveyances to final points of deposit. Sufficient
41 transportation equipment in good working order shall be on hand before work begins. All conveying
42 equipment must be clean and kept clean during concreting operations. Take every possible
43 precaution to prevent segregation or loss of ingredients.

- 1 H. Deposit concrete in wall forms in layers not greater than 12 inches in depth, each layer being
2 compacted by internal vibration before succeeding layer is placed.
- 3 I. Place concrete as near as possible to its final position to prevent segregation. Do not use vibrators
4 to transport concrete within forms. Consolidate concrete in walls, columns, beams and slabs or joist
5 construction thicker than 8" with internal vibrators (8,000 to 12,000 V.P.M.). Slabs less than 8" thick
6 may be consolidated with internal vibrators (9,000 to 13,500 V.P.M.) or vibrating screeds supported
7 on forms, boards or rails, approved by Structural Engineer, supplement vibration by forking or
8 spading by hand along surfaces adjacent to forms and construction joints.
- 9 J. Re-tempering of concrete will not be permitted. Concrete that has obtained its initial set shall be
10 discarded.
- 11 K. Exercise care in placing concrete over waterproof membranes, rigid insulation and/or protection
12 boards to avoid damaging those materials. Report damage immediately, and do not proceed until
13 damage is repaired.
- 14 L. Remove loose debris from surfaces, thoroughly wet and slush with a neat cement grout immediately
15 before placing new concrete, or apply bonding compound to surface and let dry before placing new
16 concrete.
- 17 M. Protect existing concrete work to be exposed to view and other finished materials from damage and
18 staining resulting from concreting operations. Handle concrete carefully to avoid dripping and
19 spillage. Remove spilled concrete from existing surfaces immediately. Covering sills, ledges, and
20 other surfaces with protective coverings may be necessary to protect the work.
- 21 N. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work
22 of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place
23 construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- 24 O. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as
25 shown on Drawings. Set anchor rods for machines and equipment at correct elevations, complying
26 with diagrams or templates of manufacturer furnishing machines and equipment.
- 27 P. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
28 Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete
29 surfaces.

30 **3.5 CONCRETE FINISHES AND TOLERANCES**

- 31 A. Exposed Smooth Formed Surfaces: Remove forms and perform necessary repairs and patch to
32 produce surface finish-3.0 as specified in ACI 301. Apply the following to smooth-formed finished
33 concrete exposed to view in the finished work. Confirm finishes with architect prior to concrete
34 placement by submitting shop drawings indicating locations of all types of finishes.
- 35 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete
36 surfaces and rub with carborundum brick or another abrasive until producing a uniform color
37 and texture. Do not apply cement grout other than that created by the rubbing process.
- 38 B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces
39 adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed
40 surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed
41 surfaces, unless otherwise indicated.

42 **3.6 CONCRETE SLAB FINISHES AND TOLERANCES**

- 43 A. Trowel Finish:
- 44 1. Screed concrete to an even plane, float, then power trowel the surface.

- 1
2
2. Hand trowel the surface smooth and free of trowel marks. Continue hand troweling until a ringing sound is produced as the floor is troweled.
- 3
3. Provide trowel finish as indicated on the Drawings and at the following locations:
- 4 a. Concrete floors exposed in finished work unless otherwise indicated.
5 b. Slabs to receive curing compounds and sealers.
6 c. Slabs to receive resilient flooring or carpet.
7 d. Slabs to receive waterproof membranes.
- 8 B. Fine Broom Finish:
- 9 1. Screed concrete to an even plane, float, then power trowel the surface. Provide fine hair
10 broom finish perpendicular to slope, free of loose particles, ridges, projections, voids and
11 concrete droppings.
- 12 2. Provide fine broom finish as indicated on the Drawings and at the following locations:
- 13 a. Stoop slabs.
14 b. Raised curbs and walkway areas.
15 c. Slabs to receive thin set ceramic tile.
- 16 C. Broom Finish:
- 17 1. Screed concrete to an even plane and then float. Immediately after concrete has received
18 a floated finish, give the concrete surface a coarse transverse scored texture by drawing a
19 coarse broom across the surface.
- 20 2. Provide as indicated on the Drawings and at the following locations:
- 21 a. ADA ramp slabs.
22 b. Exterior walkway slabs.
- 23 D. Float Finish:
- 24 1. Screed concrete to an even plane then float.
- 25 2. Provide as indicated on the Drawings and at the following locations:
- 26 a. Slabs to directly receive concrete topping.
27 b. Roof slabs to receive loose laid roof insulation.
- 28 E. Floor Finish Tolerances: Floor finish tolerances shall be measured by placing a freestanding
29 (unleveled) 10 foot straightedge anywhere on the slab and allowing it to rest upon two high spots
30 within 72 hours after placement of slab and removal of shoring (if present). The gap at any point
31 between the straightedge and the floor (and between the high spots) shall not exceed:
- 32 1. Slab on Grade: 1/4"
- 33 F. Slab Drainage: Finish all concrete slabs to proper elevations to insure that all surface moisture will
34 drain freely to floor drains, and that no puddle areas exist. Contractor shall bear the cost of
35 corrections to provide positive drainage.
- 36 G. Special Tolerances for Concrete Slabs: No abrupt change in vertical elevation of 1/4" or more is
37 acceptable at the interface between slabs and within areas where pedestrian traffic is expected:
- 38 **3.7 CONCRETE CURING**
- 39 A. Freshly placed concrete shall be protected from premature drying and excessively hot temperatures.

- 1 B. Concrete other than high-early strength shall be maintained above 50°F and in a moist condition for
2 at least the first 7 days after placement, except when special curing is used. Special curing
3 procedures shall not be used without written permission from the Structural Engineer of Record.
- 4 C. Formed surfaces shall be cured by leaving the formwork in place during the curing period.
- 5 D. Protect concrete from excessive changes in temperature during the curing period and at the
6 termination of the curing process. Changes in the temperature of the concrete shall be as uniform
7 as possible and shall not exceed 5°F in any one hour or 50°F in any 24 hour period.
- 8 E. Protect concrete from injury from the elements until full strength is developed. Protect from
9 mechanical injury.
- 10 F. During cold weather construction, all footings shall be protected from frost penetration until the
11 building is enclosed and temporary heat is provided.

12 **3.8 SLAB CURING**

- 13 A. Begin curing after finishing concrete, but not before free water has disappeared from concrete
14 surface. Use one of the methods described below.
- 15 B. Moisture-Retaining-Cover Curing for Concrete Floors not Exposed in Final Condition: Cover concrete
16 surface with waterproof sheet material as soon as finishing operations are complete and the concrete
17 is sufficiently hard to be undamaged by covering. The cover shall be placed flat on the concrete
18 surface, avoiding wrinkles. Sprinkle concrete with water as necessary during application of covering.
19 Place in widest practicable width, with sides and ends lapped at least 12 inches, and seal with
20 waterproof tape or adhesive. Verify that the concrete is continuously wet under the sheets; otherwise,
21 add water through soaker hoses under the sheets. Weight down covering to prevent displacement.
22 Immediately repair any holes or tears during the curing period using polyethylene sheet and
23 waterproof tape. Curing process shall be maintained for a minimum of 7 days.
- 24 C. Moisture-Retaining-Fabric Curing for Concrete Floors to Remain Exposed: Cover concrete surface
25 with moisture retaining fabric as soon as finishing operations are complete and the concrete is
26 sufficiently hard to be undamaged by covering. The cover shall be installed in accordance with
27 manufacturer's written recommendations, in largest practical widths. Wet the slab to rejection, then
28 thoroughly wet fabric side of cover and install with poly side up. Lap over adjacent covers a minimum
29 of 18". Wet all laps and outside edges to prevent displacement and to ensure intimate contact with
30 concrete and adjacent covers. Rewet as necessary and protect covers from damage during curing
31 process.
- 32 1. After minimum 7-day cure, remove moisture retaining fabric in sections.
- 33 2. A maximum of 3,500 square feet of concrete curing cover may be removed at any one time.
34 At no time shall the exposed area be permitted to dry prior to completion of the floor
35 scrubbing process.
- 36 3. Using a high powered floor scrubber capable of a minimum 80 pounds head pressure, and
37 a mild citrus-based detergent that does not damage or mar the surface in any way, scrub
38 the floor to remove any minerals or soluble salts that may have accumulated at the floor
39 surface. Rinse area thoroughly with clean fresh water. Remove water and allow floor to
40 dry. If whitening occurs during drying, repeat scrubbing process before floor dries until no
41 whitening occurs during drying.
- 42 4. All areas of the floor shall remain wet during floor scrubbing process. Expose only the
43 amount of floor surface that can be cleaned before any drying occurs without exceeding the
44 maximum allowable exposed area.
- 45 D. Curing Compound: Apply uniformly in continuous operation by low pressure spray equipment or
46 roller as soon as finishing operations are complete, free water on the surface has disappeared and
47 no water sheen can be seen. Follow the manufacturer's written instructions. Recoat areas subjected
48 to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair

1 damage during curing period. Verify compatibility of the curing compound with paint, finishes, or
2 toppings that require positive bond to the concrete. If curing compound is not compatible with paint
3 finishes or toppings, utilize a dissipating curing compound and remove in accordance with the
4 manufacturer's recommendations.

5 **3.9 PENETRATING LIQUID FLOOR TREATMENTS**

6 A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment
7 according to manufacturer's written instructions.

8 B. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface
9 repairs in accordance with manufacturer's written instructions.

10 C. Do not apply to concrete that is less than seven days old.

11 D. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat
12 brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a
13 second coat in a similar manner if surface is rough or porous.

14 **3.10 JOINT FILLING**

15 A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

16 B. Do not fill joints until construction traffic has permanently ceased.

17 C. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of
18 joint clean and dry.

19 D. Install semi-rigid joint filler in saw-cut joints and in formed joints. Overfill joint and trim joint filler flush
20 with top of joint after hardening.

21 **3.11 APPLICATION OF FLOOR SEALER - FINISH COAT**

22 A. Give concrete floors as indicated in Room Finish Schedule and where exposed in finished Work,
23 second coat of curing and sealing compound immediately prior to Substantial Completion.

24 B. Clean floors and apply sealer strictly according to manufacturer's instructions. Dilution and coverage
25 shall be as recommended by the manufacturer. Apply sealer evenly.

26 **3.12 COLD WEATHER CONCRETING**

27 A. Definition: Cold weather shall be defined as a period when for more than three successive days the
28 average daily outdoor temperature drops below 40°F. The average daily temperature is the average
29 of the highest and lowest temperature during the period from midnight to midnight. When
30 temperatures above 50°F occur during more than half of any 24 hour duration, the period shall not
31 be regarded as cold weather.

32 B. All cast-in-place concrete work occurring during cold weather shall conform to all requirements of
33 ACI 306.1, "Standard Specification for Cold Weather Concreting", published by the American
34 Concrete Institute, Detroit, Michigan, except as modified by the contract documents or this
35 specification.

36 C. Planning: The General Contractor, concrete contractor, concrete supplier and the architect shall have
37 a pre-construction conference to outline the cold weather concreting operations concerning the
38 placing, finishing, curing and protection of the concrete during cold weather. Pre-construction
39 conference shall occur before cold weather is expected to occur.

- 1 D. Detailed procedure submittal: Concrete contractor shall prepare and submit for review detailed
2 procedures for the production, transportation placement, protection, curing and temperature
3 monitoring of concrete during cold weather. Include procedures to be implemented upon abrupt
4 changes in weather conditions. Do not begin cold weather concreting until these procedures have
5 been reviewed and approved.
- 6 E. Mixing: Concrete flatwork poured in cold weather shall be proportioned to obtain a lower slump to
7 minimize the amount of bleed water during finishing. All bleed water should be skimmed off flatwork
8 prior to troweling. Concrete that will be exposed to cycles of freezing and thawing while saturated
9 should be properly air entrained as outlined in this specification.
- 10 F. Protection of Concrete: Cure and protect concrete against damage from freezing for a minimum
11 period of 72 hours, unless approved by the structural engineer. The protection period may be reduced
12 according to ACI 306.1 requirements. Concrete contractor shall submit a letter of request to reduce
13 the protection period, by outlining the method used to achieve the reduction per ACI 306.1.
- 14 1. When practical for the construction schedule, formwork shall be insulated and remain in
15 place for at least the required protection period.
- 16 G. Concrete Temperatures: The minimum temperature of concrete immediately after placement shall
17 be as specified in the following table.

Section Size	Minimum temperature of concrete as placed and maintained during the protection period	Maximum gradual decrease in surface temperature during any 24 hours after the end of the protection.	Mixing Temperatures		
			Above 30°F	0 to 30°F	Below 0°F
< 12 in	55°F	50°F	60°F	65°F	70°F
12-36 in	50°F	40°F	55°F	60°F	65°F
36-72 in	50°F	30°F	50°F	55°F	60°F
> 72 in	50°F	20°F	45°F	50°F	55°F

- 18 H. Mixing Temperatures: As the ambient air temperature decreases the concrete mixing temperature
19 shall be increased to compensate for the heat lost in the period between mixing and placement. The
20 concrete supplier shall use one or both of the following methods for increasing the concrete
21 temperature.
- 22 1. Heating the mixing water to a temperature necessary to offset the temperature losses during
23 transport. Supplier shall not heat water to temperatures in excess of 140°F, without taking
24 special precautions as outlined in ACI 306.
- 25 2. Heating the aggregate with a circulated steam piping system.
- 26 I. Temperature measurements: The Contractor shall be responsible for monitoring and recording the
27 concrete temperatures during placement and throughout the protection period.
- 28 1. Inspection personnel shall keep a record of the date, time, outside air temperature,
29 temperature of concrete as placed, and weather conditions.
- 30 2. Temperature of the concrete and the outside air shall be recorded at regular intervals but
31 not less than twice in a 24 hour period. The record shall include temperatures at several
32 points within the enclosure and on the concrete surface of sufficient frequency to determine
33 a range of temperatures.
- 34 3. Inspection agency shall submit the temperature logs to the Architect for permanent job
35 records.

1 **3.13 HOT WEATHER PROTECTION**

2 A. Definition: Hot weather shall be defined as any combination of high ambient temperature, low relative
3 humidity, high winds and intense solar radiation that leads to higher than usual evaporation. The
4 table below defines low relative humidity based on air temperature. For a given air temperature, if
5 the relative humidity is equal to or less than the specified minimum, provisions for hot weather
6 concreting shall be as follows:

Air Temperature	Minimum Relative Humidity
105°F	90%
100°F	80%
95°F	70%
90°F	60%
85°F	50%
80°F	40%
75°F	30%

7 B. Scheduling: When hot weather is expected, adjust concrete placement schedules to avoid placing or
8 finishing during the period from noon until 3:00 pm. When possible, slab pours should be delayed
9 until the building is enclosed to protect the concrete from wind and direct sunlight, Construction
10 schedule shall account for 7 day moist curing period.

11 C. Mixing: Concrete supplier shall adjust mix designs and admixtures to minimize slump loss. Concrete
12 shall be mixed at a water-cement, which is lower than the specified maximum to allow for the
13 adjustment of slump by addition of water in the field. Water reduction shall be accomplished without
14 reducing initial slump by increasing dosage of water reducing admixture.

15 D. Preparation: Do not order concrete earlier than is required to avoid delays. Cool forms, subgrades
16 and reinforcing bars with water spray from fog nozzle prior to concrete placement.

17 E. Delivery: Site traffic shall be coordinated and delivery times scheduled to minimize waiting times for
18 concrete trucks.

19 F. Placement: Preparations shall be made to place and consolidate the concrete at the fastest possible
20 rate. Maintain a continuous flow of concrete to the job site to avoid development of cold joints, during
21 placement of slabs, apply fog spray to prevent moisture loss without causing surplus water to stand
22 on concrete surface.

23 G. Finishing: Finish concrete as fast as practical. Continue fogging concrete during finishing. Where
24 fogging is not possible, apply sprayable moisture-retaining film between finishing passes.

25 H. Curing: Formed concrete shall be covered with a waterproof material to retain moisture. Flat work
26 shall be moisture cured as described in this specification. Moist curing shall continue for at least 7
27 days.

28 **3.14 FIELD QUALITY ASSURANCE**

29 A. Independent Testing Agency and Inspector shall each perform their prescribed inspection, sampling,
30 and testing services as described in Part 1 of this specification section.

31 B. In cases where samples have not been taken or tests conducted as specified or strength of laboratory
32 test cylinders for a particular portion of the structure fails to meet requirements of ACI 301, for
33 evaluation of concrete strength, Structural Engineer shall have the right to order compressive or
34 flexural test specimens or both be taken from the hardened concrete according to ASTM C42, load
35 tests according to ACI 318, or such other tests as may be necessary to clearly establish the strength
36 of the in situ concrete, and such tests shall be paid for by the Contractor.

1 **3.15 REPAIR OF DEFECTIVE AREAS**

- 2 A. All repair of defective areas shall be made, with prior approval of Architect, as to method and
3 procedure, in accordance with Section 5 of ACI 301, except specified bonding compound must be
4 used.
- 5 B. Patch form tie holes at the following locations:
- 6 1. Unfinished exposed concrete (not scheduled for painting, plus at board formed concrete
7 finish).
- 8 2. All other areas: Prime voids with bonding compound and fill with patching mortar. Strike
9 flush without overlap, float to uniform texture to match adjacent surfaces.
- 10 3. Exposed areas scheduled for spray texture:
- 11 a. Remove projections and protrusions: 1/16" or larger.
12 b. Remove continuous ridges 1/32" or larger.
13 c. Fill voids and pin holes.
- 14 4. Exposed areas scheduled for paint or epoxy:
- 15 a. Remove projections, ridges, and other protrusions 1/32" or larger.
16 b. Fill voids and pin holes 1/16" or larger.
- 17 5. Exposed areas not scheduled for paint or other finishes:
- 18 a. Remove projections, ridges and other protrusions not conforming to requirements
19 specified under Section 03 10 00.
20 b. Fill voids and pin holes not conforming to requirements specified under Section
21 03 10 00.
- 22 C. All structural repairs shall be made, with prior approval of the Architect/Engineer, as to method and
23 procedure, using the specified epoxy adhesive and/or epoxy mortar.
- 24 D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls,
25 air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and
26 other discolorations that cannot be removed by cleaning.
- 27 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than
28 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges
29 of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes
30 and voids with bonding agent. Fill and compact with patching mortar before bonding agent
31 has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with
32 bonding agent.
- 33 2. Repair defects on surfaces exposed to view by blending white Portland cement and
34 standard Portland cement so that, when dry, patching mortar will match surrounding color.
35 Patch a test area at inconspicuous locations to verify mixture and color match before
36 proceeding with patching. Compact mortar in place and strike off slightly higher than
37 surrounding surface.
- 38 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural
39 performance as determined by Architect.
- 40 E. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify
41 surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to
42 drain for trueness of slope and smoothness; use a sloped template.

- 1 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts,
2 honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate
3 to reinforcement or completely through unreinforced sections regardless of width, and other
4 objectionable conditions.
- 5 2. After concrete has cured at least 14 days, correct high areas by grinding.
- 6 3. Correct localized low areas during or immediately after completing surface finishing
7 operations by cutting out low areas and replacing with patching mortar. Finish repaired
8 areas to blend into adjacent concrete.
- 9 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
10 Prepare, mix, and apply repair underlayment and primer according to manufacturer's written
11 instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match
12 adjacent floor elevations.
- 13 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low
14 areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor
15 elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's
16 written instructions to produce a smooth, uniform, plane, and level surface.
- 17 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter,
18 by cutting out and replacing with fresh concrete. Remove defective areas with clean, square
19 cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen
20 concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching
21 concrete of same materials and mix as original concrete except without coarse aggregate.
22 Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner
23 as adjacent concrete.
- 24 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
25 Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose
26 particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching
27 mortar before bonding agent has dried. Compact patching mortar and finish to match
28 adjacent concrete. Keep patched area continuously moist for at least 72 hours.

29 **3.16 CLEANING**

- 30 A. Clean exposed concrete to remove laitance, efflorescence and stains.

31 **END OF SECTION**

**SECTION 03 30 10
CAST-IN-PLACE CONCRETE- SITE WORK**

- 1
- 2
- 3 PART 1 - GENERAL
- 4 1.1 SUMMARY
- 5 PART 2 - PRODUCTS
- 6 PART 3 - EXECUTION
- 7 3.1 EXECUTION
- 8 3.2 EXCEPTIONS
- 9

10
11 **PART 1 - GENERAL**

12
13 **1.1 SUMMARY**

- 14
15 Section includes cast-in-place concrete for the following:
- 16 Concrete sidewalks.
 - 17 Concrete driveways and driveway aprons.
 - 18 Curb and gutter.
 - 19 Concrete integral curbs and gutters.
 - 20 Concrete stair steps.
 - 21 Slabs on grade.
 - 22 Control, expansion and contraction joint devices.
 - 23
- 24 Related Sections:
- 25 Section 31 05 13 – Soils for Earthwork.
 - 26 Section 31 10 00 – Site Clearing and Removals.
 - 27 Section 31 23 16 – Earthwork.
 - 28 Section 32 11 23 – Aggregate Base Courses.
 - 29

30
31 **PART 2 - PRODUCTS**

32 Not used.

33
34
35 **PART 3 - EXECUTION**

36
37 **3.1 EXECUTION**

38
39 Except as noted below, all work shall be in accordance with Part III and IV of the City of Madison Standard
40 Specifications for Public Works Construction, 2018 Edition (or latest thereof).

41
42 **3.2 EXCEPTIONS**

43 None.

44
45
46 **END OF SECTION**

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SECTION 03 35 43
POLISHED CONCRETE FINISHING

PART 1 – GENERAL

[1.1 RELATED DOCUMENTS](#)

[1.2 SUMMARY](#)

[1.3 DEFINITIONS](#)

[1.4 ACTION SUBMITTALS](#)

[1.5 QUALITY ASSURANCE](#)

[1.6 FIELD CONDITIONS](#)

PART 2 – PRODUCTS

[2.1 LIQUID FLOOR TREATMENTS](#)

PART 3 – EXECUTION

[3.2 INSTALLATION - GENERAL](#)

[3.3 POLISHED CONCRETE INSTALLATION](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

1. Section includes polished concrete finishing for new and existing concrete floor, including scoring as indicated or required (**CONC-2**).
 2. New concrete for polished concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, initial finishing, and curing is specified in Section 03 30 00 "Cast-in-Place Concrete."
- B. Related Requirements:
1. Section 03 30 00 "Cast-in-Place Concrete" for concrete not designated as polished concrete (**CONC-1**).

1.3 DEFINITIONS

- A. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of polished concrete.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
1. Laboratory Test Reports for Credit IEQ 4.3: For stains and liquid floor treatments, documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. 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.

1.5 QUALITY ASSURANCE

- A. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a mockup submittal for review.
1. 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:
 2. Build mockups in new Mechanical Room, SE corner.
 3. Mockup to be a minimum 4'x4' area in the mechanical room. Owner wants separate review of polish/grind level prior to reviewing finish with sealer and slip-resistance additive.
 4. Demonstrate curing, finishing, and protecting of polished concrete.
 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1 SECTION 03 41 00
2 STRUCTURAL PRECAST CONCRETE

3 PART 1 – GENERAL

- 4 1.1 DESCRIPTION
- 5 1.2 QUALITY ASSURANCE
- 6 1.3 DESIGN REQUIREMENTS
- 7 1.4 SUBMITTALS
- 8 1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

9 PART 2 – PRODUCTS

- 10 2.1 MATERIALS
- 11 2.2 CONCRETE MIXES
- 12 2.3 FABRICATION AND MANUFACTURE

13 PART 3 – EXECUTION

- 14 3.1 EXAMINATION
- 15 3.2 ERECTION
- 16 3.3 FIELD QUALITY CONTROL

17 PART 1 - GENERAL

18 1.1 DESCRIPTION

- 19 A. The General and Supplementary Conditions of the Construction Contract and Division 1 - General
20 Requirements apply to the work specified in this section.
- 21 B. This section includes engineering, fabrication and erection of structural precast concrete units. Work
22 shall include, but not be limited to, the following items:
 - 23 1. Precast Hollow Core Slab Sections
- 24 C. Work shall also include headers for openings, connections, anchor bolts, templates, installation
25 instructions and grouting of precast units. Anchor bolts shall be installed by other contractor.

26 1.2 QUALITY ASSURANCE

- 27 A. Codes and Standards: Comply with the provisions of the following codes, specifications, and
28 standards except where more stringent requirements are shown or specified.
 - 29 1. ACI 301 - Standard Specifications for Structural Concrete.
 - 30 2. ACI 318 - Building Code Requirements for Reinforced Concrete.
 - 31 3. ASTM A36 – Standard Specification for Carbon Structural Steel.
 - 32 4. ASTM A82 - Standard Specification for Steel Wire, Plain for Concrete Reinforcement.
 - 33 5. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcing, Plain for Concrete
34 Reinforcement.
 - 35 6. ASTM A416 - Standard Specification for Steel Strand, Uncoated Seven-Wire for
36 Prestressed Concrete.
 - 37 7. ASTM A615 - Standard Specification for Deformed and Plain Billet Steel Bars for Concrete
38 Reinforcement.
 - 39 8. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 40 9. ASTM C150 - Standard Specification for Portland Cement.
 - 41 10. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

- 1 11. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
- 2 12. ASTM C618 - Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for
3 Use as a Mineral Admixture in Portland Cement Concrete.
- 4 13. ASTM C1240 - Standard Specification for Silica Fume for use as a Mineral Admixture in
5 Hydraulic-Cement Concrete, Mortar, and Grout.
- 6 14. ASTM F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy
7 Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength, Inch Dimensions.
- 8 15. AWS D1.1 - Structural Welding Code - Steel.
- 9 16. AWS D1.4 - Structural Welding Code - Reinforcing Steel.
- 10 17. CRSI - Manual of Standard Practice.
- 11 18. PCI MNL-120 - PCI Design Handbook – Precast and Prestressed Concrete.
- 12 19. PCI MNL-116 - Manual for Quality Control for Plants and Production of Precast and
13 Prestressed Concrete Products.
- 14 20. PCI MNL-123 - Manual on Design of Connections for Precast Prestressed Concrete.
- 15 21. PCI MNL-124 - Manual on Design for Fire Resistance of Precast Prestressed Concrete.
- 16 22. PCI MNL-126 - Manual for the Design of Hollow Core Slabs.
- 17 23. PCI MNL-127 - Recommended Practice for Erection of Precast Concrete.
- 18 24. PCI MNL-135 - Tolerance Manual for Pre-cast and Prestressed Concrete Construction.
- 19 B. Where any provisions of other pertinent codes and standards conflict with this specification, the more
20 stringent provision shall govern.
- 21 C. Qualifications:
 - 22 1. Fabricate and perform testing of precast units in accordance with PCI MNL-116 Manual for
23 Quality Control for Plants and Production of Precast and Prestressed Concrete Products.
 - 24 2. The engineer preparing design calculations, shop drawings, and other structural data for
25 the precast concrete units shall be a registered Professional Engineer in the state where
26 the project is located, with not less than three (3) years of continuous experience in design
27 work of similar scope to that shown on the drawings.
 - 28 3. The precast concrete manufacturer shall not have less than five (5) years of continuous
29 experience in the manufacture of precast concrete units.
 - 30 4. The precast concrete manufacturer shall have production capacity to produce required units
31 without causing delay in work.
 - 32 5. The precast concrete erector shall not have less than five (5) years of continuous experience
33 in the erection of structural precast concrete units.
 - 34 6. All welding of structural steel shall be performed by operators who have been qualified within
35 the past one year as prescribed in "Qualification Procedures" of the American Welding
36 Society (AWS).

1 **1.3 DESIGN REQUIREMENTS**

- 2 A. Precast units and their connections shall be designed by a qualified professional engineer licensed
3 in the State where the project is located, to withstand the loadings and criteria indicated on the
4 drawings and contained within this section.
- 5 B. Precast units shall be designed to meet the project fire ratings as specified by the Architect and as
6 indicated on the drawings.

7 **1.4 SUBMITTALS**

- 8 A. Shop Drawings:
- 9 1. Prepare and submit complete erection and detailed shop drawings for Engineer's approval,
10 including but not limited to the following:
- 11 a. Member piece marks and completely dimensioned size, shape and type of each
12 member.
- 13 b. Plans and/or elevations locating and defining all products furnished by the
14 manufacturer. Indicate separate face and backup mix locations plus thicknesses
15 and indicate the limits of each finish.
- 16 c. Indicate locations and extent and treatment of dry joints if two-stage casting is
17 proposed.
- 18 d. Sections and details showing connections, cast-in items and their relation to the
19 structure.
- 20 e. Methods of connecting, anchoring, fastening, bracing and attaching work of other
21 trades.
- 22 f. Indicate welded connections by AWS standard symbols.
- 23 g. Indicate size and location of openings, either saw-cut or formed, to be coordinated
24 with other trades.
- 25 h. Joints and openings in units and between units and the structure.
- 26 i. Description of all loose, cast-in and field hardware.
- 27 j. Headers required for openings.
- 28 2. Manufacturer shall submit the shop drawings showing floor member and roof member layout
29 to the Mechanical Contractor for review of openings and inserts required by mechanical
30 components.
- 31 B. Product Data:
- 32 1. Products: Prepare and submit product data for Engineer's approval for shop applied
- 33 C. Qualification Data:
- 34 1. When requested by the Architect, provide lists of completed projects with project names
35 and addresses, names and addresses of architects and owners, and other information
36 specified.

- 1 D. Design Calculations:
- 2 1. Prepare and submit one complete set of signed and sealed structural calculations to the
3 Owner for approval of each unique and distinct precast member and precast connection
4 prepared and certified by a Professional Engineer licensed in the state where the project is
5 located. Owner's approval or acceptance of the manufacturer's design calculations shall in
6 no way relieve the manufacturer of the full responsibility for the correctness of the
7 calculations or the structural performance of the completed members or sections.
- 8 E. Production Drawings:
- 9 1. Be prepared to submit, upon the Owner's request, production drawings indicating the
10 following:
- 11 a. Sections and details to indicate quantities, type and position of reinforcing steel,
12 anchors, inserts, etc.
- 13 b. Dimensions and finishes.
- 14 c. Prestress for strand and concrete strengths.
- 15 d. Methods for storage and transportation.
- 16 F. Test Reports:
- 17 1. Be prepared to submit, upon the Owner's request, test reports showing compliance with the
18 testing provisions contained in PCI MNL-116, Manual for Quality Control for Plants and
19 Production of Precast and Prestressed Concrete Products.
- 20 G. Certifications:
- 21 1. Submit manufacturer's certifications that the precast units have been fabricated to meet the
22 fire ratings specified by the Architect.
- 23 2. Submit copies of welding procedures and personnel.

24 **1.5 PRODUCT DELIVERY, STORAGE AND HANDLING**

- 25 A. Precast units shall be transported, stored and erected in a manner that will avoid any damage or
26 deformation. Precast units shall be lifted and supported during manufacturing, stock-piling,
27 transporting and erection operations only at the lifting and/or supporting points shown on the
28 approved shop drawings.
- 29 B. Store units at the project site in such a manner so as to prevent cracking, distortion, staining, or other
30 physical damage, and so that markings are visible. Protect edges of precast units from chipping or
31 spalling.

32 **PART 2 - PRODUCTS**

33 **2.1 MATERIALS**

- 34 A. Concrete Materials:
- 35 1. Refer to Section 03 30 00, Concrete, for additional information and requirements for
36 concrete, formwork, materials application, admixtures, accessories, etc.
- 37 2. Portland Cement: ASTM C150, Type I or III, gray and white.
- 38 a. Standard gray Portland cement may be used for nonexposed backup concrete.

- 1 3. Normal-Weight Aggregates: ASTM C33
- 2 a. Face-Mix Coarse Aggregates: Selected, hard, and durable; free of material that
3 reacts with cement or causes staining.
- 4 b. Face-Mix Fine Aggregates: Selected, natural or manufactured sand of the same
5 material as coarse aggregate, unless otherwise approved by Architect.
- 6 4. Admixtures – As determined by precast manufacturer, but conforming to:
- 7 a. Air-entraining Admixtures: ASTM C260.
8 b. Chemical Admixtures: ASTM C494.
9 c. Fly Ash: ASTM C618, Class C or F.
10 d. Silica Fume: ASTM C1240.
- 11 5. Water – Potable and free from foreign materials in amounts harmful to concrete and
12 embedded steel.
- 13 B. Reinforcement and Prestressing Strands:
- 14 1. Refer to Section 03 20 00, Reinforcement, for additional information and requirements for
15 fabrication, installation, etc.
- 16 2. Reinforcing Bars - ASTM A615, Grade 60, deformed.
- 17 3. Prestressing Strand - ASTM A416, Grade 250 or 270, uncoated, seven-wire, low-relaxation
18 strand.
- 19 4. Plain-Steel Wire - ASTM A82.
- 20 5. Plain-Steel Welded Wire Reinforcement- ASTM A185, fabricated from steel wire into flat
21 sheets.
- 22 C. Anchors, Inserts and Connection Material:
- 23 1. Steel Plates and Shapes - ASTM A36.
24 2. Anchor Rods - ASTM F1554.
25 3. Deformed Bar Anchors - ASTM A496.
26 4. Steel Headed Studs - AWS D1.1, Type B.
27 5. High-Strength Bolts - ASTM F3125, Grade A325.
28 6. Welding Electrodes - Comply with AWS standards.
- 29 D. Grout:
- 30 1. Cement Grout - Portland cement, ASTM C150, Type I, and clean, natural sand, ASTM
31 C144. Mix at a ratio of 1.0 part cement to 2.5 parts sand, by volume, with minimum water
32 required for placement and hydration. Minimum compressive strength to be 3000 psi.
- 33 2. Non-metallic, non-shrink grout - Grout shall be a pre-mixed, non-metallic, non-corrosive,
34 non-staining product, containing selected silica sand, Portland cement, shrinkage
35 compensating agents, plasticizing and water reducing agents, and complying with ASTM
36 C1107. Minimum compressive strength to be 7,000 psi at 28 days.
- 37 E. Bearing Pads: Manufacturer to choose one of the following.
- 38 1. Elastomeric Pads: AASHTO M251, plain, vulcanized, 100 percent polychloroprene
39 (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A
40 durometer, minimum tensile strength 2250 psi per ASTM D412.
- 41 2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented
42 synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer.

- 1 3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-
2 duck fabric bonded to an elastomer. Surface hardness of 80 to 100 Shore A durometer.
- 3 4. Hardboard: AHA A135.4, Class 1, tempered hardboard strips, smooth on both sides.
- 4 5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

5 **2.2 CONCRETE MIXES**

- 6 A. Concrete shall achieve a minimum 28-day compressive strength of 5000 psi.
- 7 B. Prestressed concrete shall achieve a minimum release strength of 3500 psi.

8 **2.3 FABRICATION AND MANUFACTURE**

- 9 A. Fabricate precast member in plastic lined or metal forms which are true to line and plane. Form
10 openings of 100 square inches in area.
- 11 1. Edge and Corner Treatment: Uniformly chamfered.
- 12 B. General Contractor shall identify opening locations to precast manufacturer for coordination and shall
13 provide precaster with cast-in items required by other trades.
- 14 C. Manufacture units in compliance with PCI MNL-116. Comply with the tolerances specified in PCI
15 MNL-116.
- 16 D. Precast hollow core slabs shall have end bearings lengths as indicated on the structural drawings,
17 but at least 3 inches minimum.
- 18 E. Clean reinforcement of loose rust, mill scale, and other materials, which may reduce or destroy bond
19 with concrete.
- 20 F. Place reinforcement to obtain at least the minimum coverage for concrete protection as specified by
21 ACI-318. Arrange, space and securely tie bars and bar supports to hold reinforcement in position
22 during concrete placement. Set wire ties so ends are directed into concrete, not toward exposed
23 concrete surfaces.
- 24 G. Install welded wire reinforcement in longest lengths practical. Lap adjoining pieces one full mesh
25 and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either
26 direction.
- 27 H. Cast in structural inserts, plates and accessories as indicated on the Drawings and as determined
28 by the fabricator for erection and anchorage. Cast in architectural accessories to receive windows,
29 dowels, waterstops, flashings and other similar work.
- 30 I. Provide cast-in-place or structural steel headers for openings larger than one slab width according
31 to fabricator's written recommendations.
- 32 J. Finishes, unless otherwise indicated on the drawings, provide:
- 33 1. Precast hollow core slabs:
- 34 a. Standard underside - As resulting from casting against approved forms. Small
35 surface holes, normal color variations, normal joint marks, minor chips and spalls
36 will be tolerated. Major imperfections, honeycombs, structural defects, or other
37 defects will not be tolerated.
- 38 b. Standard topside - As resulting from vibrating screed and additional hand finishing
39 at projections. Normal color variations, normal joint marks, minor chips and spalls
40 will be tolerated. Major imperfections, honeycombs, structural defects, or defects
41 which would affect finished floor materials will not be tolerated.

- 1 c. Topside Finish for Composite Construction - Broom or rake top finish of precast
2 concrete units for bonding with concrete floor topping.
- 3 d. Exposed ends - Strands shall be recessed a minimum of ½ in., the holes filled with
4 grout and rubbed flush.
- 5 K. Provide permanent markings to identify pick-up points and orientation in structure, complying with
6 the markings indicated on approved shop drawings. Imprint date of casting on each precast unit on
7 a surface, which will not show in the structure.
- 8 L. Weight of hollow core precast units shall not exceed the following:
- 9 1. 8" hollow-core: 63 psf.
10 2. 10" hollow-core: 76 psf.
11 3. 12" hollow-core: 86 psf.

12 **PART 3 - EXECUTION**

13 **3.1 EXAMINATION**

- 14 A. Examine areas and conditions under which Work is to be performed and notify the General
15 Contractor in writing of conditions detrimental to proper and timely completion of the Work. Do not
16 proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the
17 installer.
- 18 B. Do not install precast concrete units until supporting concrete has attained 75% of its design
19 compressive strength.

20 **3.2 ERECTION**

- 21 A. The General Contractor shall be responsible for:
- 22 1. Providing suitable access to the site, proper drainage, and firm, level bearing for the hauling
23 and erection equipment to operate under their own power.
- 24 2. At time of delivery, provide area inside and outside the building to allow adequate
25 maneuverability for erection procedures.
- 26 3. Placement and accurate alignment of anchor bolts, plates or dowels in footings or
27 foundation walls, ledge angles and other field placed support units.
- 28 4. Provide all shoring and bracing required by manufacturer's recommendations and as
29 indicated on the Precast Shop Drawings.
- 30 B. Install bearing pads on true, level and uniform bearing surfaces. Maintain the correct position of the
31 pads until precast units are in place.
- 32 C. Locate lifting hooks as specified on the shop drawings.
- 33 D. Erect units in compliance with PCI MNL-127, Recommended Practices for Erection of Precast
34 Concrete.
- 35 E. After precast units are in place, remove lifting hooks and handling inserts, level bottom of slab to
36 correct for unequal camber prior to grouting and perform necessary welding in accordance with AWS
37 D1.1.
- 38 F. Shore and brace precast units to maintain location, stability and alignment until permanent
39 connections are established.
- 40 G. Precast units shall be properly aligned and leveled as required by the shop drawings.

- 1 H. Remove hoisting or shoring devices and fill voids with sand-cement grout to be flush to adjacent
2 surfaces.
- 3 I. Repair damaged metal surfaces by cleaning and applying a coat of galvanizing repair paint to
4 galvanized surfaces or repainting damaged surfaces. Damage to those surfaces having special
5 finishes as specified, shall be brought to the attention of the Architect.
- 6 J. Required openings less than 100 square inches in area in precast units shall be field cut. No
7 openings shall be cut so as to pass through the leg sections of the prestressed units. Holes cut in
8 slabs not concealed by finished ceiling systems shall be cut through, starting on underside with hand
9 or mechanical chisels or from top only with core type drills. Restrict openings to as small as possible.
- 10 K. Use flowable cement grout (minimum compressive strength 5,000 psi) to grout keyways between
11 hollow core slabs as follows:
- 12 1. Clean and prepare keyways to be filled. Joints should be free of debris and dust.
13 2. Seal underside of slab joints to prevent grout leakage.
14 3. Fill grout keys full and strike flush with top surface.
15 4. Remove grout that seeps through to ceiling below before grout hardens.
- 16 L. Welding: Comply with AWS D1.1 and AWS D1.4
- 17 1. Protect precast concrete units and bearing pads from damage by field welding or cutting,
18 and provide noncombustible shields as required.
- 19 M. Field touch up:
- 20 1. Immediately after erection, field welding and/or final bolting, clean exposed surfaces of
21 precast concrete units after erection to remove weld marks, other markings, dirt and stains.

22 **3.3 FIELD QUALITY CONTROL**

- 23 A. The contractor may choose to employ a separate testing laboratory to evaluate the precast
24 manufacturer's quality control and testing methods. If requested, the precast manufacturer shall
25 allow the Owner's testing company access to the manufacturing facility, and provide samples of
26 material for additional evaluation.
- 27 B. Precast units which do not conform to specified requirements, including strength, tolerances, and
28 finishes, or which are damaged during handling and erection, shall be replaced with precast concrete
29 units that meet the requirements of this specification.
- 30 C. The contractor shall be responsible for the cost of corrections to other work affected by or resulting
31 from corrections to precast concrete work.
- 32 D. Precast units having dimensions greater than required will be rejected if appearance or function of
33 the structure is adversely affected, or if larger dimensions interfere with other construction. The
34 contractor shall be responsible for the cost of necessary repair, removal and replacement of rejected
35 units.
- 36 E. The precast supplier shall inspect all field cutting, which cuts reinforcing. The precast manufacturer
37 shall issue a letter to the Owner either accepting the system as modified or directing corrective
38 procedures to offset cut reinforcing. The contractor shall be responsible for the cost of any corrective
39 procedures.
- 40 F. Clean all exposed surfaces after erection to remove weld marks, other markings, stains and dirt.
41 Wash and rinse according to manufacturer's recommendations. Protect other work from damage or
42 staining during cleaning operations.

43 **END OF SECTION**

SECTION 04 22 00
REINFORCED UNIT MASONRY

- 1
- 2
- 3 PART 1 – GENERAL
- 4 1.1 DESCRIPTION
- 5 1.2 QUALITY ASSURANCE
- 6 1.3 FIRE RESISTANT CONSTRUCTION
- 7 1.4 QUALIFICATIONS
- 8 1.5 SUBMITTALS
- 9 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING
- 10 PART 2 – PRODUCTS
- 11 2.1 MATERIALS
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32 **PART 1 - GENERAL**

33 **1.1 DESCRIPTION**

- 34 A. The General and Supplementary Conditions of the Construction Contract and Division 1 - General
- 35 Requirements apply to the Work specified in this Section.

- 36 B. This section includes the supply and installation of all reinforced concrete unit masonry and
- 37 accessories as shown on the Drawings and herein specified.

- 38 C. This section defines work including: Concrete unit masonry, mortar, grout, reinforcement, anchors,
- 39 ties, and accessories.

- 40 D. Masonry and cavity wall board insulation is specified elsewhere; however, installation shall be a part
- 41 of the Work of this Section.

- 42 E. Notes indicated on the drawings regarding reinforced unit masonry shall be considered part of this
- 43 specification.

44 **1.2 QUALITY ASSURANCE**

- 45 A. Codes and Standards: Comply with the provisions of the following codes, specifications, and
- 46 standards except where more stringent requirements are shown or specified.

- 47 1. ACI 530.1/ASCE 6/TMC 602 - Masonry Standards Joint Committee (MSJC) Code and
- 48 Specification.

- 49 2. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

- 1 3. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete
2 Reinforcement.
- 3 4. ASTM A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- 4 5. ASTM A951 - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
- 5 6. ASTM C90 - Standard Specification for Load-bearing Concrete Masonry Units.
- 6 7. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- 7 8. ASTM C387 - Specification for Packaged, Dry, Combined Materials for Mortar and
8 Concrete.
- 9 9. ASTM C476 - Standard Specification for Grout for Unit Masonry.
- 10 10. ASTM C780 - Test Method for Preconstruction and Construction Evaluation of Mortars for
11 Plain and Reinforced Unit Masonry.
- 12 11. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.
- 13 12. IMIAC - International Masonry Industry All-Weather Council: Recommended Practice and
14 Guide Specification for Cold Weather Masonry Construction.
- 15 B. Where any provision of other pertinent codes and standards conflict with this specification, the more
16 stringent provision shall govern.
- 17 **1.3 FIRE RESISTANT CONSTRUCTION**
- 18 A. Whenever a fire resistant classification is indicated for unit masonry construction, provide concrete
19 block units as tested and listed for the particular fire resistant construction.
- 20 **1.4 QUALIFICATIONS**
- 21 A. Installation Company: Company shall have not less than five years of documented experience in the
22 construction of masonry projects of similar scope and complexity.
- 23 B. For the actual cutting and placing of concrete masonry units, use only skilled masons who are
24 thoroughly experienced with the material and methods specified and thoroughly familiar with the
25 design requirements. Workers shall have not less than three years of documented experience in the
26 construction of masonry walls.
- 27 **1.5 SUBMITTALS**
- 28 A. Prepare and submit product data for Engineer's approval. Data should include all horizontal
29 reinforcement, anchoring devices, and all other embedded items herein specified.
- 30 B. Prepare and submit shop drawings detailing the fabrication, bending, and placement of reinforcing
31 bars.
- 32 C. When requested by the Architect and before any materials are delivered to Worksite, submit for
33 approval one sample of the proposed masonry materials, showing the full range of colors and
34 textures available.
- 35 D. Submit a letter of certification from manufacturer of concrete masonry units certifying that all concrete
36 masonry units delivered to the worksite are in strict conformance with the provisions of this
37 specification.
- 38 E. Submit concrete unit masonry compressive strength test results demonstrating that the units meet
39 the specified strength. Test must be conducted by a qualified independent testing agency.

- 1 F. Submit mortar mix design and test results as follows:
- 2 1. Mix designs shall indicate type and proportions of ingredients in compliance with the
3 proportion requirements of ASTM C270.
- 4 2. For mix designs not in accordance with the proportion requirements of ASTM C270, the
5 mortar test history must be performed in accordance with ASTM C780 to verify performance
6 with property requirements of ASTM C270. Tests must meet the type of mortar specified on
7 the drawings. Tests must be done by a qualified independent testing agency.
- 8 G. Submit grout mix designs and test results as follows:
- 9 1. Mix designs shall indicate type and proportions of the ingredients in compliance with the
10 proportion requirements of ASTM C476.
- 11 2. For mix designs not in accordance with the proportion requirements of ASTM C476, the
12 grout test history must be performed in accordance with ASTM C1019 to verify performance
13 with property requirements of ASTM C476. Tests must meet the type of grout specified on
14 the drawings. Test must be done by a qualified independent testing agency.
- 15 a. Perform one test prior to construction and perform at least one test during
16 construction for each 5000 square feet of wall.

17 **1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- 18 A. All masonry units shall be delivered to worksite and stacked on pallets to allow the circulation of air
19 through all units. Cover with a waterproof covering anchored to prevent displacement during high
20 winds.
- 21 B. Masonry accessories, including reinforcing steel, shall be stored clear of the ground to prevent
22 deterioration or damage due to moisture, temperature changes, contaminants, and corrosion.
- 23 C. Deliver all materials in sufficient quantity and time to maintain approved construction schedule.
- 24 D. Deliver all packaged materials in manufacturer's original containers, with labels and markings intact
25 and legible.
- 26 E. Immediately remove all damaged materials or containers from site and replace with new items.

27 **PART 2 - PRODUCTS**

28 **2.1 MATERIALS**

- 29 A. Concrete Masonry Units: ASTM C90, as follows:
- 30 1. Weight: Normal weight.
31 2. Compressive Strength: As indicated on the Drawings.
32 3. Nominal Size: As indicated on the Drawings.
33 4. Actual Size: 3/8" less than nominal size.
34 5. Aggregates:
35 a. Normal Weight: ASTM C33.
36 6. Provide special units for 90° corners, lintels jambs, sash, control joints, headers, bond
37 beams, and other special conditions conforming to ASTM C90.
38 7. All exposed unit masonry shall be free of chips, cracks, and other imperfections.
- 39 B. Concrete Brick Units: ASTM C55, as follows:
- 40 1. Weight: Normal weight.
41 2. Compressive Strength: As indicated on the Drawings.
42 3. Nominal Size: As indicated on the Drawings.

- 1 4. Actual Size: 3/8" less than nominal size.
2 5. Aggregates: Normal weight shall conform to ASTM C33.
- 3 C. Mortar and Grout:
- 4 1. Compressive Strength: As indicated on the drawings.
5 2. Mortar type for masonry construction shall be as designated in the General Notes of the
6 drawings, conforming to ASTM C270, and grout shall conform to ASTM C476.
7 3. Portland Cement: ASTM C150, Type I, non-staining, no air entraining, natural color cement.
8 4. Blended Cement: ASTM C595.
9 5. Masonry Cement: ASTM C91.
10 6. Mortar Aggregate: ASTM C144, standard masonry type.
11 7. Hydrated Lime: ASTM C207.
12 8. Quicklime: ASTM C5, non-hydraulic type.
13 9. Premix Mortar: ASTM C387, using gray cement, normal strength.
14 10. Grout Aggregate: ASTM C404.
15 11. Grout Fine Aggregate: Sand.
16 12. Water: Clean and potable.
17 13. Do not use calcium chloride in mortar or grout.
- 18 D. Joint Reinforcement:
- 19 1. Provide joint reinforcement formed from galvanized carbon-steel wire in accordance with
20 ASTM A641, Class 1 for interior walls; and ASTM A153, Class B-2, for exterior walls.
- 21 2. Provide welded wire units prefabricated with 9 gauge deformed continuous side rods and 9
22 gauge plain cross rods into straight lengths of not less than 10 feet with matching corner
23 and tee units. Unit widths to be 1-1/2" to 2 inch less than the wall thickness.
- 24 3. For multi-wythe concrete masonry walls, provide truss type reinforcement with a third side
25 rod extending out into the other wythe.
- 26 E. Ties and Anchors:
- 27 1. Rigid wall anchors shall be fabricated of 1/4 inch thick mild steel, 1 inch wide by 24 inches
28 long, with ends turned up.
- 29 2. Wall ties shall be corrugated 7/8 inch wide by 7 inches long, minimum 16 gauge galvanized
30 steel.
- 31 3. Structural steel column anchor ties shall be adjustable weld-on 1/4 inch diameter steel rods
32 and minimum 3/16 inch galvanized triangular shaped tie.
- 33 4. For anchorage to concrete, use dovetail sheet metal anchor sections and triangular shaped
34 16 gauge wire tie sections sized to extend within 1 inch of masonry face.
- 35 F. Reinforcement:
- 36 1. Use deformed billet bars with unprotected finish conforming to ASTM A615, 60 ksi yield
37 strength.
- 38 G. Control and Expansion Joints:
- 39 1. Control joint material for unit masonry shall consist of cross-shaped extruded polyvinyl
40 gaskets sized to match wall thickness.
- 41 2. Expansion or joint filler material, unless otherwise indicated, shall be 1/2 inch thick asphalt
42 impregnated cellular board.
- 43 3. Compressible filler shall be pre-molded filler strips complying ASTM D1056, Type 2, Class
44 A, Grade 1; compressible up to 35 percent of width and thickness indicated.

- 1 4. Bond breaker strips shall be asphalt-saturated, organic roofing felt complying with ASTM
2 D226, Type I (No. 15 asphalt felt).

3 **PART 3 - EXECUTION**

4 **3.1 EXAMINATION**

- 5 A. Verify that field conditions are acceptable and are ready to receive work.
- 6 1. Verify foundations are constructed with tolerances conforming to the requirements of ACI
7 117.
- 8 2. Verify reinforcing dowels are positions in accordance with the Project Drawings.
- 9 B. Verify items provided by other Sections of work are properly sized and located.
- 10 C. Verify that built-in items are in proper location and ready for roughing into masonry work.
- 11 D. Beginning of installation means Installer accepts existing conditions.

12 **3.2 PREPARATION**

- 13 A. Layout walls in advance for accurate spacing of bond patterns, with uniform joint widths and to
14 properly locate openings, expansion joints, and offsets.
- 15 B. Direct and coordinate placement of metal anchors supplied to other Sections.
- 16 C. The Contractor is responsible to design, provide, and install bracing that will ensure stability of
17 masonry during construction. Maintain in place until building structure provides permanent bracing.
- 18 D. Remove laitance, loose aggregate, and anything else that would prevent mortar from bonding to the
19 foundation.
- 20 E. Clean all reinforcement by removing mud, oil, or other materials that will adversely affect or reduce
21 bond at the time mortar or grout is placed.

22 **3.3 COLD WEATHER CONSTRUCTION**

- 23 A. When ambient temperature is below 40°F (4.5°C), implement cold weather procedures.
- 24 B. Special cold weather requirements for various temperature ranges are as follows:
- 25 1. Air temperature 40°F to 32°F (4.5°C to 0°C): Sand or mixing water shall be heated to
26 produce mortar temperatures between 40°F to 120°F (4.5°C to 49°C).
- 27 2. Air temperature 32°F to 25°F (0°C to -4°C):
- 28 a. Sand and mixing water shall be heated to produce mortar temperatures between
29 40°F to 120°F (4.5°C to 49°C). Maintain temperature of mortar on boards above
30 freezing.
- 31 b. Grout aggregates and mixing water shall be heated to produce grout temperature
32 between 70°F to 120°F (21°C to 49°C).
- 33 3. Air temperature 25°F to 20°F (-4°C to -7°C): Comply with requirements for air temperature
34 between 32°F to 25°F (0°C to -4°C) and the following:
- 35 a. Provide heat sources on both sides of the wall under construction to heat masonry
36 surfaces to 40°F (4.5°C). Windbreaks shall be used when wind is excess of 15
37 miles per hour.

- 1 b. Heat masonry to a minimum temperature of 40°F (4.5°C) prior to grouting.
- 2 4. Air temperature 20°F(-7°C) and below. Comply with requirements for air temperature
3 between 32°F to 20°F (0°C to -7°C) and the following:
- 4 a. Enclosure and auxiliary heat shall be provided to maintain air temperature above
5 freezing. Do not lay masonry units having a temperature below 20°F (-7°C).
- 6 C. Cold-Weather Protection:
- 7 1. When the mean daily air temperature is 40°F to 25°F (4.5°C to -4°C), masonry shall be
8 completely covered for 24 hours with weather-resistive membrane.
- 9 2. When the mean daily air temperature is 25°F to 20°F (-4°C to -7°C), masonry shall be
10 completely covered for 24 hours with insulating blankets with a weather-resistive covering.
11 Extend time period to 48 hours for grouted masonry.
- 12 3. When the mean daily air temperature is 20°F (-7°C) or below, masonry temperature shall
13 be maintained above freezing for 24 hours by enclosure and auxiliary heating. Extend time
14 period to 48 hours for grouted masonry.
- 15 D. Do not lay masonry units having either a temperature below 20°F (-6.7°C) or containing frozen
16 moisture, visible ice, or snow on their surfaces.
- 17 E. Remove visible ice and snow from the top surface of existing foundations and masonry to receive
18 new construction. Heat these surfaces above freezing.
- 19 F. Top of all walls not enclosed or sheltered shall be covered with strong weather-resistive material at
20 the end of each day or shutdown.
- 21 G. Partially completed walls shall be covered at all times when work is not in progress.
- 22 H. Any section of masonry deemed frozen and damaged shall be removed before continuing
23 construction of that section.
- 24 I. Masonry units shall be dry at the time of placement. Wet or frozen unit shall not be laid.
- 25 **3.4 HOT WEATHER CONSTRUCTION**
- 26 A. Hot weather construction is defined when:
- 27 1. The ambient air temperature exceeds 100°F or exceeds 90°F with a wind velocity greater
28 than 8 mph.
- 29 B. Hot Weather Procedures:
- 30 1. Maintain sand piles in a damp, loose condition.
- 31 2. Provide necessary conditions and equipment to produce mortar having a temperature below
32 120°F.
- 33 3. Flush mixer, mortar transport container, and mortar boards with cool water before they come
34 in contact with mortar ingredients or mortar.
- 35 4. Use mortar within two hours of initial mixing.
- 36 5. Fog spray all newly constructed masonry until damp, at least three times a day until the
37 masonry is three days old.
- 38 6. Do not spread mortar beds more than 4' ahead of masonry. Set masonry within one minute
39 of spreading mortar.

1 **3.5 COURSING**

- 2 A. Establish lines, levels, and coursing indicated. Protect from displacement. Grouted cells shall be in
3 vertical alignment.
- 4 B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform
5 thickness.
- 6 C. Lay concrete masonry units in bond to match existing at all patch and infill locations.
- 7 D. Unless noted otherwise, provide masonry control joints at 30'-0" on center maximum.
- 8 E. Unless noted otherwise, build non-bearing interior partitions walls full height to underside of structure.

9 **3.6 PLACING AND BONDING**

- 10 A. Unless noted otherwise, construct masonry in running bond pattern.
- 11 B. Lay hollow masonry units with face shell bedding on head and bed joints.
- 12 C. Bed and Head Joints:
- 13 1. Unless otherwise required, construct 3/8 inch thick bed and head joints.
- 14 2. At foundation, construct bed joint of the starting course a thickness not less than 1/4 inch,
15 and not more than 3/4 inch.
- 16 3. Unless otherwise noted, tool joint with a round jointer when the mortar is thumbprint hard.
- 17 4. Remove masonry protrusions extending 1/2 inch or more into cells or cavities to be grouted.
- 18 D. Collar Joints:
- 19 1. Unless otherwise required, solidly fill collar joints less than 3/4 inch wide with mortar as the
20 job progresses.
- 21 E. Place hollow units as follows:
- 22 1. With face shells of bed joints fully mortared.
- 23 2. With webs fully mortared in:
- 24 a. All courses of piers columns and pilasters.
25 b. In the starting course on foundations.
26 c. When necessary to confine grout or loose fill.
27 d. When otherwise required.
- 28 3. With head joints mortared, a minimum distance from each face equal to the face shell
29 thickness of the unit.
- 30 4. Vertical cells to be grouted are aligned and openings are unobstructed.
- 31 F. Place solid units as follows:
- 32 1. Unless otherwise required, solidly fill bed and head joints with mortar.
33 2. Do not fill head joints by grouting with mortar.
34 3. Construct head by shoving mortar tight against the adjoining unit.
35 4. Do not deeply furrow bed joints.
- 36 G. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

- 1 H. Remove excess mortar as work progresses.
- 2 I. Interlock intersections and external corners.
- 3 J. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be
4 made, remove mortar and replace.
- 5 K. Perform job site cutting of masonry units with proper tools to provide straight, clean, undamaged
6 edges. Prevent broken masonry unit corners or edges.
- 7 L. Isolate masonry partitions from vertical structural framing members with a control joint.
- 8 M. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks
9 with compressible joint filler and pin top of wall with prefabricated partition anchors that allow vertical
10 movement.

11 **3.7 HORIZONTAL REINFORCEMENT AND ANCHORS**

- 12 A. Install horizontal joint reinforcement as follows:
- 13 1. Interior non-load bearing walls - 24 inches on center vertically.
- 14 2. Exterior walls and interior load bearing walls - 16 inches on center vertically.
- 15 3. Parapet walls - 8 inches on center vertically unless noted otherwise.
- 16 4. Foundation walls - 8 inches on center vertically unless noted otherwise.
- 17 B. Place masonry joint reinforcement in first and second horizontal joints above and below openings.
18 Extend minimum 16 inches each side of opening.
- 19 C. Place joint reinforcement continuous in first and second joint below top of walls.
- 20 D. Lap joint reinforcement ends minimum 6 inches. Extend minimum 16 inches each side of openings.
- 21 E. Place joint reinforcement so longitudinal wires are embedded in mortar with a minimum cover of 1/2
22 inch when not exposed to weather or earth, and 5/8 inch when exposed to weather or earth.
- 23 F. Anchor masonry to structural members where masonry abuts or faces such members.
- 24 G. Wall Ties:
- 25 1. Embed the ends of wall ties in mortar joints. Embed wall tie ends at least 1/2" into the outer
26 face shell of hollow units. Embed wire wall ties at least 1-1/2" into the mortar bed of solid
27 masonry units or solid grouted hollow units.
- 28 2. Do not bend wall ties after embedded in grout or mortar.
- 29 3. Unless otherwise required, install adjustable ties in accordance with the following
30 requirements.
- 31 a. One tie for each 1.77 square feet of wall area.
- 32 b. Do not exceed 16 inches horizontal or vertical spacing.
- 33 c. The maximum misalignment of bed joints from one wythe to the other is 1-1/4".
- 34 d. The maximum clearance between connecting parts of the ties is 1/16".
- 35 e. When pintle legs are used, provide ties with at least two legs made of wire size
36 W2.8.

- 1 f. Install wire ties perpendicular to a vertical line on the face of the wythe from which
2 they protrude. Where one-piece ties or joint reinforcement is used, the bed joints
3 of adjacent wythes shall align.
- 4 g. Unless otherwise required, provide additional unit ties around all openings larger
5 than 16 inches in either dimension. Space ties around perimeter of opening at a
6 maximum of 3 feet on center. Place ties within 12 inches of opening.
- 7 H. Veneer Anchors:
- 8 1. Embed veneer anchors in mortar joint and extend into the veneer a minimum of 1-1/2 inch
9 at least 5/8 inch cover to the outside face.
- 10 2. Install adjustable veneer anchors as follows:
- 11 a. The maximum misalignment of bed joints from one wythe to the other is 1-1/4 inch.
- 12 b. The maximum clearance between connecting parts of the ties is 1/16 inch.
- 13 c. When pintle legs are used, provide anchors with at least two legs made of wire
14 size W2.8.
- 15 d. Provide at least one adjustable two-piece anchor of wire size W1.7 or 22 gauge
16 corrugated sheet metal anchor for each 2.67 square feet of wall area.
- 17 3. Install non-adjustable veneer anchors for each 3.5 square feet of wall area.
- 18 4. Space anchors at a maximum of 32 inches horizontally and 16 inches vertically.
- 19 5. Provide additional anchors around all openings larger than 16 inches in either dimension.
20 Space anchors around the perimeter of opening at a maximum of 3 feet on center. Place
21 anchors within 12 inches of the opening.

22 **3.8 VERTICAL REINFORCEMENT**

- 23 A. Support and secure reinforcing bars from displacement beyond the tolerances allowed by
24 construction loads or by placement of grout or mortar. Maintain position within 1/2 inch of masonry
25 unit or formed surface, but not less than 1/4 inch (only when fine grout is used).
- 26 B. Lap splices minimum 48 bar diameters.
- 27 C. Dowels in footings shall be set to align with cores containing reinforcing steel.
- 28 D. Place and consolidate grout fill without displacing reinforcing. Completely embed reinforcing bars in
29 grout.
- 30 E. All cells containing reinforcing in concrete blocks shall be filled solid with grout.
- 31 F. Do not bend reinforcement after it is embedded in grout or mortar.
- 32 G. Reinforce masonry unit cores and cavities with vertical reinforcement bars and grout as indicated on
33 drawings. Place reinforcements and ties in grout spaces prior to grouting.
- 34 H. Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 192
35 bar diameters.
- 36 I. Place steel in walls and flexural elements within 1/2 inch of required location.
- 37 J. Place vertical bars within 2 inches of the required location along the length of the wall.

1 **3.9 CONCRETE UNIT MASONRY**

- 2 A. Lay masonry units with core cells vertically aligned clear of mortar dropping, debris, loose
3 aggregates, and any material deleterious to masonry grout.
- 4 B. Do not place grout until height of masonry to be grouted has attained sufficient strength to resist grout
5 pressure.
- 6 C. Do not wet concrete masonry units before laying.
- 7 D. Grout spaces less than two inches in width with fine grout using low lift grouting techniques. Grout
8 spaces two inches or greater in width with course grout using high lift or low lift grouting techniques.
- 9 E. When grouting is stopped for more than one hour, terminate grout 1-1/2 inch below top of upper
10 masonry unit to form a positive key for subsequent grout placement.
- 11 F. Grouting:
- 12 1. Place grout in lifts not to exceed five feet. Consolidate grout at time of placement.
- 13 a. Consolidate grout pours 12 inches or less in height by mechanical vibration or by
14 puddling.
- 15 b. Consolidate grout pours exceeding 12 inches in height by mechanical vibration
16 and reconsolidate by mechanical vibration after initial water loss and settlement
17 has occurred.
- 18 2. When the grout pour height exceeds 5 feet 4 inches, provide cleanout opening no less than
19 3 inches high at the bottom of each cell to be grouted by cutting one face shell of masonry
20 unit. Opening should be sufficient size to permit removal of debris.
- 21 3. Pump grout into spaces. Maintain water content in grout to intended slump without
22 aggregate segregation.
- 23 4. Limit grout lift to 60 inches and rod for grout consolidation. Wait 30 to 60 minutes before
24 placing next lift.

25 **3.10 GROUTING REINFORCED CONCRETE BLOCK WALLS**

- 26 A. Provide reinforcing bars at indicated spacing and grout bars and voids solid with grout having a 28-
27 day compressive strength as listed in the General Notes of the Drawings.

28 **3.11 GROUTING BLOCK CELLS BELOW LINTELS AND BEAMS**

- 29 A. For lintel spans greater than 5'-0": Grout block cells 24 inches beneath the lintel and 24 inches each
30 side of lintel.
- 31 B. For all beams: Grout block cells 24 inches beneath the lintel and 24 inches each side of lintel

32 **3.12 LINTELS AND BOND BEAMS**

- 33 A. Steel Lintels: Install steel lintel supplied from Division 5 of this specification. Provide a minimum of 8
34 inches of end bearing on each side of opening unless noted otherwise. All exterior exposed steel
35 lintels shall be hot-dip galvanized in accordance with ASTM A123.
- 36 B. Bond Beams:
- 37 1. Use specially shaped lintel units at hollow masonry unit walls, with reinforcing bars as shown
38 and filled with concrete grout.
- 39 2. Provide minimum 8 inches of end bearing at each side of opening.

- 1 3. Provide reinforced concrete block lintels over openings less than 3'-0" wide which are not
2 scheduled.
- 3 4. Place and consolidate concrete without disturbing the reinforcing.
- 4 5. Allow lintels to reach 100 percent of their design strength before removing temporary
5 supports.
- 6 6. Do not place vertical control joints above bond beams or within 8 inches each side of bond
7 beam.

8 **3.13 CONTROL AND EXPANSION JOINTS**

- 9 A. Do not continue horizontal joint reinforcement through control and expansion joints except above wall
10 openings.
- 11 B. Provide vertical expansion, control, and isolation joints as indicated on the drawings. If joints are not
12 indicated, then provide control joints at a maximum spacing of 30'-0".
- 13 C. Install all built-in masonry accessory items as work progresses.
- 14 D. Rake out mortar where sealants are shown or required.

15 **3.14 BUILT-IN WORK AND EMBEDDED ITEMS**

- 16 A. As work progresses, build in metal door and glazed frames, fabricated metal lintels, anchor bolts,
17 plates, and other items furnished by other Sections.
- 18 B. Place pipes and conduits passing horizontally through masonry beams or masonry walls in steel
19 sleeves or cored holes.
- 20 C. Install pipes and conduits passing horizontally through non-bearing masonry partitions.
- 21 D. Install and secure connectors, flashing, weep holes, weep vents, nailing blocks, and other
22 accessories.
- 23 E. Do not embed aluminum conduits, pipes, and accessories in masonry, grout, or mortar, unless
24 effectively coated or covered to prevent aluminum-cement chemical reaction or electrolytic action
25 between aluminum and steel.
- 26 F. Build in items plumb and level.
- 27 G. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with
28 grout.
- 29 H. Do not build in organic materials subject to deterioration.

30 **3.15 PREFABRICATED CONCRETE AND MASONRY ITEMS**

- 31 A. Erect prefabricated concrete and masonry items in accordance with the requirements.

32 **3.16 TOLERANCES**

- 33 A. Comply with tolerances in the MSJC Specification and the following:
- 34 1. Maximum variation from alignment of columns and pilasters: 1/4 inch.
- 35 2. Maximum variation from unit to adjacent unit: 1/32 inch.
- 36 3. Maximum variation from plane of wall: 1/4 inch in 10 feet and 3/8 inch in 20 feet or more.

- 1 4. Maximum variation from plumb: 1/4 inch per story non-cumulative.
- 2 5. Maximum variation from level coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch
- 3 in 30 feet.
- 4 6. Maximum variation of bed joint thickness: 1/8 inch.

5 **3.17 CUTTING AND FITTING**

- 6 A. Cut and fit for chases, pipes, conduit, sleeves, and structural members. Coordinate with other
- 7 Sections of work to provide correct size, shape, and location.
- 8 B. Obtain the Engineer's approval prior to cutting or fitting masonry work not indicated or where
- 9 appearance or strength of masonry work may be impaired.

10 **3.18 CLEANING**

- 11 A. Remove excess mortar and mortar smears.
- 12 B. Replace defective mortar.
- 13 C. Clean soiled surfaces with cleaning solution.
- 14 D. Use non-metallic tools in cleaning operations.
- 15 E. Clean exposed masonry surfaces of all stains, efflorescence, mortar or grout droppings, and debris.

16 **3.19 PROTECTION OF FINISHED WORK**

- 17 A. Without damaging completed work, provide protective boards at exposed external corners that may
- 18 be damaged by construction activities.

19 **END OF SECTION**

SECTION 04 43 13.13

ANCHORED STONE MASONRY VENEER

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Stone masonry anchored to unit masonry backup.
 - 2. Stone masonry anchored to cold-formed metal framing and sheathing.
- B. Related Requirements:
 - 1. Section 04 20 00 "Unit Masonry" for cavity-wall insulation, concealed flashing, horizontal joint reinforcement, and veneer anchors.
 - 2. Section 05 4000 "Cold-Formed Metal Framing" for back-up assembly.
 - 3. Section 07 62 00 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
- C. Products Installed but Not Furnished under This Section Include:
 - 1. Steel lintels in unit masonry.
 - 2. Steel shelf angles for supporting unit masonry.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each variety of stone, stone accessory, and manufactured product.
- B. LEED Submittals:
 - 1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
- C. Samples for Verification:
 - 1. For each stone type indicated. Include at least four 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.
 - 3. For each type of weep, sealant and accessories for confirmation and color selection.

1.5 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. Stone Test Reports: For each stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous three years.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs experienced stonemasons and stone fitters.
- B. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a mockup submittal for review.
 - 1. The stone veneer mockup shall be incorporated into a single combined mockup with CMU and structural steel stud back-up assemblies.
- C. Mock-Up shall be building corner with window opening illustrating stone veneer and mortar combinations, coursing, and pattern. Mock-up shall be constructed with:
 - 1. Stone veneer as specified in this Section.
 - 2. Mortar, grout, wall ties, and weep system specified in this section.
 - 3. Structural supporting wall as indicated.
 - 4. Sheathing, Underlayment, Rigid board thermal insulation, and other specified accessories.
 - 5. Clear sealer and anti-graffiti coating.
 - 6. Size: approximately 4 feet 1.2 m high by 4 feet 1.2 m long.
 - 7. Provide slab or foundation support as required by size of mock-up.
 - 8. Testing: Use water hose to test completed mock-up for water resistance and performance of weep system.
 - 9. Obtain Architect's approval of mock-up prior to beginning stone veneer installation.
 - 10. Retain mock-up during construction as quality standard. Completely
 - 11. Protect accepted mockups from the elements with weather-resistant membrane.
 - 12. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 13. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store 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.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

- A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed stone 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 stone masonry face.
 - 1. Protect base of walls from rain-splashed mud and mortar splatter using coverings spread on the ground and over the 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 end of each day to prevent rain from splashing mortar and dirt on completed stone 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 stone masonry damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above 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 ACI 530.1/ASCE 6/TMS 602.

1.9 COORDINATION

- A. Advise installers of other work about specific requirements for placement of reinforcement, veneer anchors, flashing, and similar items to be built into stone masonry.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from single quarry 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.
- C. Varieties and Sources: Subject to compliance with requirements, provide stone of varieties and from sources complying with Section 04 42 00 "Exterior Stone Cladding."

2.2 LIMESTONE

- A. Application: Full Bed Veneer. **(STN-1)**
- B. Application: Special Shapes – Sills **(STN-2)**
- C. Material Standard: Comply with ASTM C 568.
 - 1. Stone Type Dolomitic Limestone.
 - 2. ASTM C97 Water Absorption .36%.
 - 3. ASTM C97 Density 174.2 pcf.
 - 4. ASTM C99 Modulus of Rupture 1,470 psi.
 - 5. ASTM C170 Compressive Strength w/ Rift 29,040 psi.
 - 6. Compressive Strength Across Rift 34,240 psi.
 - 7. ASTM C880 Flexural Strength 1,740 psi.
 - 8. ASTM C482 Shear Bond Strength 239 psi.
 - 9. Mortar mix: 1 part Portland cement, 3.3 parts sand, 0.5 parts water by weight.
 - 10. ASTM C482 Shear Bond Strength 491 psi
 - 11. Mortar mix: 1 part Portland cement, 3.3 parts sand, 0.25 parts water, 0.25 parts Acryl 60 by weight.
 - 12. Regional Materials: Limestone shall be fabricated within 500 miles of Project site from stone that has been extracted within 500 miles of Project site.
 - 13. Description: Dolomitic limestone.
 - 14. Varieties and Sources: Subject to compliance with requirements, provide the following:
 - 15. Sole Source: Buechel Stone Corp; Fond du Lac Country Squire/Rustic; Rustic.
 - 16. Color Range: light grays, buff, tans, some browns/light golds.
- D. Application:
 - 1. Material Standard: Comply with ASTM C 568.
 - 2. Indiana limestone – Buff.

- E. Special Shapes: Cut Stone Sill. **(STN-2)**
 - 1. Provide shapes as indicated on the Drawings and as follows:
 - a. Sill Dimension: 7 inches D x 48 inches L x 1 3/4 inches H (1-1/2 inches at sloped face). 66 inches length where required to avoid a butt joint in sills longer than 48 inches but less than 66 inches.
 - b. Smooth surface- Rock faced front edge only.
 - 2. Material shall be furnished in sizes indicated plus or minus 1/2 inch (12 mm).
 - a. Color shall be: Indiana Buff
- F. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.3 MORTAR MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Portland Cement: ASTM C 150, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.
 - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Mortar Mix: ASTM C270.
- F. Mortar Cement: ASTM C 1329.
- G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in stone masonry mortar.
- H. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Mix shall produce color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments shall not exceed 10 percent of portland cement by weight.
- I. Aggregate: ASTM C 144 and as follows:
 - 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.
- J. Water: Potable.

2.4 VENEER ANCHORS

- A. Product: H-B Rubble Stone Anchor System, CMU and stud backup applications.
 - 1. Basis of Design (Metal stud back-up): Tie-HVR-195VB Anchor System.
 - 2. Basis of Design (CMU Back-up): Tie-HVR-295V Anchor System - Ladder Type.
- B. Materials:
 - 1. Stainless Steel Sheet Metal: ASTM A666, ASTM A480, ASTM A240/A240M, and ASTM A167 - AISI Type 316.
 - 2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 316.
 - 3. Stainless Steel Vertical J-Hook: ASTM A276 - AISI Type 316
 - 4. Wire Reinforcement: Wire ties formed from W1.7 or 0.148-inch-diameter, stainless-steel wire.
- C. Size: Sufficient to extend at least halfway, but not less than 1-1/2 inches, through stone masonry and with at least a 5/8-inch cover on exterior face.
 - 1. Ties are bent in the form of triangular loops designed to be attached to masonry joint reinforcement specified in Section 04 22 00 "Reinforced Unit Masonry" with vertical wires passing through ties and through eyes projecting from masonry joint reinforcement.

2.5 STONE TRIM ANCHORS

- A. Stone Trim Anchors: Units fabricated with tabs or dowels designed to engage kerfs or holes in stone trim units and holes for fasteners or post installed anchor bolts for fastening to substrates or framing as indicated.
- B. Materials: Fabricate anchors from stainless steel, ASTM A 240/A 240M or ASTM A 666, Type 304. Fabricate dowels from stainless steel, ASTM A 276, Type 304.
- C. Fasteners for Stone Trim Anchors: Annealed stainless-steel bolts, nuts, and washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

2.6 EMBEDDED FLASHING MATERIALS

- A. Through Wall Flashing (TWF): Self-Adhered Through Wall Flashing Membrane with Stainless Steel Drip Edge.
1. Through Wall Flashing Membrane: 3M 3015TWF.
 2. Performance:
 - a. Colour: Black.
 - b. Thickness: 0.40 mm (15.5 mils).
 - c. Film Thickness: 0.19 mm (7.5 mils).
 - d. Application Temperature: -18°C to 66°C.
 - e. Elongation (ASTM D412 Die C): >600%.
 - f. Tensile Strength (ASTM D412 Die C): >7.0 MPa (>1000 psi).
 - g. Puncture Resistance Membrane (ASTM E154): >170 N (>38 lbf).
 - h. Nail Sealability (ASTM D1970, Section 7.9): Pass.
 - i. Water Vapour Permeance (ASTM E96 Method B): 0.05 Perms.
 - j. Air Permeance of Membrane @75 Pa (ASTM E2178) 0.0013 L/s.m2.
 - k. Lap Adhesion (ASTM D1876): >4.2 N/cm..
 - l. Low Temperature Flexibility@ -30°C Bend Test (CGSB 37-GP-56M): Pass.
 - n. Moisture absorption (ASTM D570): <0.1%.
 3. Stainless Steel Drip Edge:
 - a. Where flashing is partly exposed and is indicated to terminate at wall face, use flexible flashing with a stainless steel drip edge.
- B. Adhesives, Primers, and Seam Tapes for Flexible Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Clear Water Repellant: Refer to Section 07 19 00.
- B. 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, urethane, or PVC.
- C. Cementitious Dampproofing for Limestone: Cementitious formulation recommended by ILI and nonstaining to stone, compatible with joint sealants, and noncorrosive to veneer anchors and attachments.
- D. Provide complete weep system to separate stone veneer from structural back-up wall and provide means to remove water entering air cavity and allow wall to vent properly; EMC 3639 Weep System by Buechel Stone Corporation.
1. System Components: Fabricated from plastic extrusions.
 - a. Collection and drainage membrane: corrugated plastic sheet with permeable fabric facing to be placed vertically and continuously behind stone veneer on structural back-up. EMC-3639 by Buechel Stone Corporation.
 - b. Weeps: Cellular plastic material placed at base of stone veneer wall to receive water from collection and drainage membrane and convey it horizontally to weep strips spaced at 16 inches (406 mm) and penetrating through base mortar bed; SCW-3639 by Buechel Stone Corporation.
 - c. Material properties:
 - 1) Water vapor transmission tested in accordance with ASTM E96: 13.8 grains per hour per square foot.
 - 2) Permeability tested in accordance with ASTM E96: 13.7 perm-inches.
 - 3) Compressive strength tested in accordance with ASTM D1612: 30 PSI at 10 percent strain.
 - 4) Flexural breaking load tested in accordance with ASTM D4632: 136 pounds minimum
 - 5) Puncture resistance tested in accordance with ASTM D4833: 48.7 pounds.

2.8 CAVITY-WALL INSULATION

- A. Extruded-Polystyrene Board Insulation: Provide insulation per requirements of Section 07 2100.
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.9 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.
1. Basis of Design: Prosoco Vana Trol.

2.10 FABRICATION

- A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.
 - 1. For limestone, comply with recommendations in ILLI's "Indiana Limestone Handbook."
- B. Cut and/or split stone to produce pieces of thickness, size, and shape indicated, including details on Drawings and pattern specified in "Setting Stone Masonry" Article.
- C. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.
- D. Cut and drill sinkages and holes in stone for anchors and supports.
- E. Carefully inspect stone at quarry or fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units before shipment.
 - 1. Clean sawed backs of stone to remove rust stains and iron particles.
- F. Thickness of Stone: Provide thickness indicated, but not less than the following:
 - 1. Bed Depth: 3 inches to 5 inches.
 - 2. Thickness: 4 inches plus or minus 1 inch.
- G. Finish exposed stone faces and edges to comply with requirements indicated for finish and to match approved samples and mockups.
 - 1. Finish: Natural cleft.
 - 2. Finish for Sills: Smooth.
 - 3. Finish for Copings: Smooth.
 - a. Finish exposed ends of copings same as front and back faces.

2.11 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.
 - 2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
 - 3. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the 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 Stone Masonry: Comply with ASTM C 270, Property Specification.
 - 1. Mortar for Setting Stone: Type S – w100 linen or Type S Gray. (Color to be determined by mock-up).
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 - 1. Pigments containing only metallic oxides shall not exceed 10 percent of portland cement by weight.
 - 2. Pigments containing only metallic oxides shall not exceed 5 percent of mortar cement by weight.
 - 3. Mix to match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces indicated to receive stone masonry, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone masonry.
- B. Examine substrate to verify that dovetail slots, inserts, reinforcement, veneer anchors, flashing, and other items installed in substrates and required for or extending into stone masonry are correctly installed.
- C. Examine wall framing, sheathing, and weather-resistant sheathing paper to verify that stud locations are suitable for spacing of veneer anchors and that installation will result in a weatherproof covering.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Accurately mark stud centerlines on face of weather-resistant sheathing paper before beginning stone installation.
- B. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone 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 SETTING STONE MASONRY

- A. Perform necessary field cutting and trimming as stone is set.
 - 1. Use power saws to cut stone that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snipping.
 - 2. Use hammer and chisel to split stone that is fabricated with split surfaces. Make edges straight and true, matching similar surfaces that were shop or quarry fabricated.
 - 3. Pitch face at field-split edges as needed to match stones that are not field split.
- B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
- C. Arrange stones in rubble pattern with joint widths within tolerances indicated.
- D. Set stone to comply with requirements indicated on Drawings. Install supports, fasteners, and other attachments indicated or necessary to secure stone masonry in place. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
- E. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than 1/4 inch at narrowest points or more than 1/2 inch at widest points.
- F. Provide sealant joints of widths and at locations indicated.
 - 1. Keep sealant joints free of mortar and other rigid materials.
 - 2. Sealing joints is specified in Section 07 92 00 "Joint Sealants."
- G. Install embedded flashing and weep system at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
 - 1. At stud-framed walls, extend flashing through stone masonry, up sheathing face at least 8 inches, and behind weather barrier.
 - 2. At lintels and shelf angles, extend flashing full length of angles but not less than 6 inches into masonry at each end.
 - 3. At sills, extend flashing not less than 4 inches at ends.
 - 4. At ends of head and sill flashing, turn up not less than 2 inches to form end dams.
- H. Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.
 - 1. Space weep holes o.c. as indicated.
 - 2. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material.
- I. Install vents in head joints at top of each continuous cavity at spacing indicated.
 - 1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.4 INSTALLATION OF ANCHORED STONE MASONRY

- A. Anchor stone masonry to unit masonry with wire anchors unless otherwise indicated. Connect anchors to masonry joint reinforcement with vertical rods inserted through anchors and through eyes of masonry joint reinforcement projecting from unit masonry.
- B. Embed veneer anchors in mortar joints of stone masonry at least halfway, but not less than 1-1/2 inches, through stone masonry and with at least a 5/8-inch cover on exterior face.
- C. Space anchors not more than 18 inches o.c. vertically and 32 inches o.c. horizontally, with not less than one anchor per 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings, sealant joints, and perimeter at intervals not exceeding 12 inches.
- D. Set stone in full bed of mortar with full head joints unless otherwise indicated. Build anchors into mortar joints as stone is set.
- E. Provide cavity between stone masonry and backup construction unless otherwise indicated. Keep cavity free of mortar droppings and debris.
 - 1. Slope beds toward cavity to minimize mortar protrusions into cavity.
 - 2. Do not attempt to trowel or remove mortar fins protruding into cavity.

3.5 TOOLING

- A. Tool joints, when mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
 - 1. Concave at main field of wall.
 - 2. Smooth flush at window jambs.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace stone masonry of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
 - 2. Defective joints.
 - 3. Stone masonry not matching approved samples and mockups.
 - 4. Stone masonry not complying with other requirements indicated.
- B. Replace in a manner that results in stone masonry matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
 - 5. Clean stone masonry by bucket and brush hand-cleaning method described in BIA Technical Note No. 20, Revised II, using job-mixed detergent solution.
 - 6. Clean stone masonry with cleaner applied according to manufacturer's written instructions.
 - 7. Clean limestone masonry to comply with recommendations in ILL's "Indiana Limestone Handbook."

3.7 WATER REPELLENT APPLICATION

- A. After cleaning, treat exposed stone surfaces and mortar joints with clear water repellent coating. Apply in accordance with manufacturer's instructions. Verify surfaces are clean and thoroughly dry prior to application.
- B. Refer to Section 07 1900 for product and application.

3.8 EXCESS MATERIALS AND WASTE

- A. Dispose of off-site.

END OF SECTION 04 43 13.13

SECTION 05 12 23
STRUCTURAL STEEL

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19 PART 1 - GENERAL

20 1.1 DESCRIPTION

- 21 A. The General and Supplementary Conditions of the Construction Contract and Division 1 - General
- 22 Requirements apply to the work specified in this section.

- 23 B. This section includes fabrication and erection of structural steel work, as shown on the Drawings and
- 24 specified herein. Work shall include, but not be limited to the following items:
 - 25 1. Structural steel
 - 26 2. Base and bearing plates.
 - 27 3. Deck support angles and framing for roof openings.
 - 28 4. Steel lintel members for masonry openings.
 - 29 5. Edge angles and bent plates.
 - 30 6. Connection plates.
 - 31 7. Shear stud connectors.
 - 32 8. Architecturally Exposed Structural Steel (AESS).
 - 33 9. All other steel items as listed in AISC – “Code of Standard Practice for Steel Buildings and
 - 34 Bridges” as shown on structural and architectural drawings.

- 35 C. Work shall also include grouting of all structural steel members where indicated.

- 36 D. Structural notes indicated on the drawings regarding structural steel framing should be considered a
- 37 part of this specification.

- 38 E. No substitutions will be allowed without the Engineer’s approval.

39 1.2 QUALITY ASSURANCE

- 40 A. Codes and Standards: Comply with the provisions of the following codes, specifications, and
- 41 standards except where more stringent requirements are shown or specified.
 - 42 1. AISC - Specification for Structural Joints Using High-Strength Bolts.
 - 43 2. AISC - Code of Standard Practice for Buildings and Bridges.
 - 44 3. AISC - Specification for the Design of Steel Hollow Structural Sections.

- 1 4. AISC - Specification for Allowable Stress Design of Single-Angle Members or Specification
2 for Load and Resistance Factor Design of Single-Angle Members.
- 3 5. AISC 360-10 – Specification for Structural Steel Buildings – Allowable Strength Design, 14th
4 Edition.
- 5 6. ASTM A36 - Standard Specification for Carbon Structural Steel.
- 6 7. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated
7 Welded and Seamless
- 8 8. ASTM A108 - Standard Specification for Steel Bar, Carbon, Cold-Finished, Standard
9 Quality.
- 10 9. ASTM A123 - Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and
11 Steel Products.
- 12 10. ASTM A153 - Standard Specification for Zinc Coating (Hot Dip), on Iron and Steel Hardware.
- 13 11. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials
14 for High-Temperature Service.
- 15 12. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile
16 Strength.
- 17 13. ASTM A500 - Standard Specification for Cold Formed Welded and Seamless Carbon Steel
18 Structural Tubing in Rounds and Shapes.
- 19 14. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
- 20 15. ASTM A572 - Standard Specification for High Strength, Low-Alloy Columbium-Vanadium
21 Structural Steel.
- 22 16. ASTM A992 - Standard Specification for Steel for Structural Shapes for use in Building
23 Framing.
- 24 17. ASTM A1085 - Standard Specification for Cold-Formed Welded Carbon Steel Hollow
25 Structural Sections.
- 26 18. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and
27 Steel.
- 28 19. ASTM F436 - Standard Specification for Hardened Steel Washers.
- 29 20. ASTM F1554 - Standard Specification for Anchor Bolts, Steel 36, 55 and 105 ksi Yield
30 Strength
- 31 21. ASTM F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy
32 Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength, Inch Dimensions.
- 33 22. AWS D1.1 - Structural Welding Code.
- 34 23. SSPC - Steel Structures Painting Council.
- 35 B. Where any provisions of other pertinent codes and standards conflict with this specification, the more
36 stringent provision shall govern.
- 37 C. Fabrication, Erection, and Welding Qualifications:
 - 38 1. Fabricate structural steel members in accordance with AISC Specification for the design,
39 fabrication and erection of structural steel for buildings.

- 1 2. Steel fabricator shall not have less than five (5) years of continuous experience in fabrication
2 of structural steel framing.
- 3 3. Steel erector shall not have less than five (5) years of continuous experience in the erection
4 of structural steel framing.
- 5 4. All welding of structural steel shall be performed by operators who have been recently
6 qualified as prescribed in "Qualification Procedures" of the American Welding Society
7 (AWS).
- 8 D. Tolerances: Tolerances shall be as indicated by the AISC Code of Standard Practice for Buildings
9 and Bridges except that tolerances for fabricating, rolling, cambering and erection shall not be
10 cumulative.

11 **1.3 TESTING AND INSPECTION**

- 12 A. Inspection and Testing:
- 13 1. The Owner shall employ an Inspection Agency to perform the duties and responsibilities
14 specified below.
- 15 2. Refer to architectural, civil, mechanical, and electrical specifications for testing and
16 inspection requirements of non-structural components.
- 17 3. Work performed on the premises of a fabricator approved by the building official need not
18 be tested and inspected per the table below. The fabricator shall submit a certificate of
19 compliance that the work has been performed in accordance with the approved plans and
20 specification to the building official and the Architect and Engineer of Record.
- 21 4. Duties of the Inspection Agency:
- 22 a. Perform all testing and inspection required per approved testing and inspection
23 program.
- 24 b. Furnish inspection reports to the building official, the Owner, the Architect, the
25 Engineer of Record, and the General Contractor. The reports shall be completed
26 and furnished within 48 hours of inspected work.
- 27 c. Submit a final signed report stating whether the work requiring Inspection was, to
28 the best of the Inspection Agency's knowledge in conformance with the approved
29 plans and specifications.
- 30 5. Structural Component Testing and Inspection Schedule for Section 05 12 23 is as follows:

Structural Steel	Continuous	Periodic	Referenced Standard
1. Material verification of high-strength bolts, nuts, and washers:			
A. Identification markings to conform to ASTM standards specified in the approved construction documents.		X	Applicable ASTM material standards: AISC 360, Section A3.3
B. Manufacturer's certificate of compliance required.		X	
2. Inspection of high-strength bolting:			
A. Snug-tight joints.		X	
B. Pretensioned and slip-critical joints using turn-of-nut with matchmarking or direct tension indicator methods of installation.		X	AISC 360, Section M2.5

Structural Steel	Continuous	Periodic	Referenced Standard
C. Pretensioned and slip-critical joints using turn-of-nut without matchmarking or calibrated wrench methods of installation.	X		
3. Material verification of structural steel:			
A. Identification markings to conform to AISC 360.		X	AISC 360, Section M5.5
B. Manufacturer's certified test reports.		X	
4. Material verification of weld filler materials:			
A. Identification markings to conform to AWS specification in the approved construction documents.		X	AISC 360, Section A3.5 and applicable AWS A5 documents
B. Manufacturer's certificate of compliance required		X	
5. Inspection of welding:			
A. Complete and partial joint penetration groove welds	X		AWS D1.1
B. Multi-pass fillet welds	X		AWS D1.1
C. Single-pass fillet welds > 5/16" (7.9 mm)	X		AWS D1.1
D. Plug and slot welds.	X		AWS D1.1
E. Single-pass fillet welds ≤ 5/16" (7.9 mm)		X	AWS D1.1
F. Composite stud testing		X	AWS D1.1
6. Inspection of steel frame joint details for compliance:			
A. Details such as bracing and stiffening.		X	
B. Member locations.		X	
C. Application of joint details at each connection.		X	

1 **1.4 SUBMITTALS**

2 A. Shop Drawings:

3 1. Prepare and submit complete erection and detailed shop drawings for Engineer's approval,
4 including framing plans indicating size, weight and location of all structural members. Shop
5 drawings shall indicate methods of connecting, anchoring, fastening, bracing and attaching
6 work of other trades.

7 a. Where contract documents indicate verify in field (VIF) dimensions, shop drawings
8 shall indicate these dimensions and Contractor shall note that the dimensions have
9 been verified.

10 b. This specification modifies AISC Code of Standard Practice by deleting the
11 following sentence from 4.4.1(c): "Release by the Owner's Designated
12 Representatives for Design and Construction for the Fabricator to begin fabrication
13 using the approved submittals." Review of the shop drawings by the Engineer shall
14 not relieve the fabricator of this responsibility.

15 2. Furnish both the Engineer and Architect with one copy of the following:

- 16 a. Final shop drawings containing all review notations.
17 b. Field Use/For Construction Drawings.

18 3. The steel fabricator shall submit a setting plan for all embedded items for Engineer's
19 approval.

20 4. Shop drawings shall identify and mark AESS members and items. Specific project
21 requirements for AESS (required blast cleaning, SSPC designation, special handling etc.)
22 relating to shop fabrication and field erection practices shall be indicated on the shop
23 drawings.

- 1 5. Welder's Certification: Submit certification for all welders employed on the project
2 demonstrating they have been AWS qualified to perform the welding procedures required
3 for this project.
- 4 6. General Contractor/Construction Manager to provide copies of field concrete cylinder
5 breaks indicating the concrete meets 75% of the design compressive strength to the steel
6 erector.
- 7 B. The General Contractor shall conduct a field survey of as-built anchors and bearing plate locations
8 and elevations prior to steel erection. Survey shall be furnished to the steel fabricator. Contractor
9 shall identify deviations from approved shop drawings and submit proposed repairs and modifications
10 to the Engineer and steel fabricator for approval.
- 11 C. Product Data:
- 12 1. Prepare and submit product data for Engineer's approval for shop applied primers, finished
13 paint system, expansion and/or adhesive anchors, non-shrink grout and other
14 miscellaneous materials.

15 **1.5 PRODUCT DELIVERY, STORAGE AND HANDLING**

- 16 A. Steel members shall be transported, stored and erected in a manner that will avoid any damage or
17 deformation. Materials should be stored to allow easy access for inspection and identification. Bent
18 or deformed members will be rejected and shall be replaced or repaired at the expense of the
19 responsible party. Store clear of the ground and in such a manner as to eliminate excessive handling.
- 20 B. Store fasteners in a protected location. Clean and re-lubricate bolts and nuts before use.

21 **1.6 DEFINITIONS**

- 22 A. Category 3 AESS: AESS that is out of reach to touch and can be viewed from a distance 20 feet or
23 more or is designated as "Category 3 AESS" in the Contract Documents.

24 **PART 2 - PRODUCTS**

25 **2.1 MATERIALS**

- 26 A. Structural Steel:
- 27 1. All structural steel shall be free from defects impairing strength, durability or appearance.
28 All structural steel shall meet the latest minimum requirements as follows:
- 29 a. Structural steel shapes, bars and plates shall conform to the ASTM designations
30 listed in the General Notes of the Drawings.
- 31 b. Square and rectangular structural tubing shall be cold formed conforming to the
32 ASTM designations listed in the General Notes of the Drawings.
- 33 c. Round structural tubing shall be cold formed conforming to the ASTM designations
34 listed in the General Notes of the Drawings.
- 35 B. High Strength Structural Bolts:
- 36 1. High strength structural bolts shall conform to the ASTM designations listed in the General
37 Notes of the Drawings.
- 38 2. High strength bolts shall be detailed and installed in accordance with AISC - "Specification
39 for Structural Joints Using High-Strength Bolts."
- 40 3. Manufacturer's symbol and grade markings shall appear on all bolts and nuts.

- 1 C. Anchoring Devices:
- 2 1. Anchor Rods: Anchor rods used with structural steel members shall be plain threaded rods
3 conforming to the ASTM designations listed in the General Notes of the Drawings.
- 4 2. Expansion Anchors: Expansion anchors shall consist of one-piece wedge type carbon steel
5 anchors with heavy-duty nuts and washers. All components shall be zinc plated in
6 accordance with ASTM B633. Refer to the drawing details and General Notes for the
7 expansion anchors used as the basis of design and the acceptable alternates.
- 8 3. Adhesive Anchoring System: Adhesive anchoring system shall consist of a threaded anchor
9 rod complete with nut and washer and the adhesive cartridge. Refer to the drawing details
10 and General Notes for the adhesive anchoring systems used as the basis of design and the
11 acceptable alternates.
- 12 a. Nuts shall meet ASTM A563, Grade DH, and washers shall meet ASTM F436.
- 13 b. All components shall be zinc plated in accordance with ASTM B633 SC1.
- 14 c. Adhesive shall consist of a two-part acrylic based adhesive applied in a dual
15 cartridge dispensing system that properly mixes the components at the point of
16 application.
- 17 D. Welding Materials:
- 18 1. Type required for material being welded in conformance with AWS D1.1.
- 19 E. Stud Connectors:
- 20 1. For threaded studs that are being used to connect steel beams to embed plates, use ASTM
21 A108, Type A, Grades 1010 through 1020 forged steel, headed uncoated with a minimum
22 tensile strength of 61,000 psi. Fabricated within the tolerances set forth in AWS D1.1.
- 23 2. Studs applied by means of the electric arc welding process and shall use an arc shield
24 ferrules of heat resistant ceramic.
- 25 F. Paints and Primers:
- 26 1. Fabricator's standard lead- and chromate-free, non-asphalitic, rust-inhibiting primer.
- 27 2. Galvanizing repair paint: SSPC Paint 20.
- 28 3. Refer to Specification Section 09 90 00 for additional paint requirements.
- 29 G. Non-Shrink Grout for Base and Bearing Plates: Non-shrink grout, conforming to ASTM C1107, shall
30 be pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sand,
31 Portland cement, shrinkage compensating agents, plasticizing and water reducing agents. All
32 constituents shall meet the requirements of these specifications. Minimum compressive strength at
33 28-days shall be 7,000 psi as determined by ASTM C109. Follow manufacturer's instructions for
34 handling, mixing, placing and curing. Acceptable products are:
- 35 1. Euclid Chemical Company - Euco N.S. Grout
36 2. L&M Construction Chemical - Crystex.
37 3. Master Builders - Masterflow 713.
38 4. Sonneborn - SonnogROUT.
39 5. Five Star Products Inc. – Five Star Grout.
40 6. Dayton Superior - Sure-Grip High Performance Grout.
41 7. Dayton Superior – 1107 Advantage Grout.

1 **2.2 FABRICATION AND MANUFACTURE**

2 A. Fabrication Procedures:

- 3 1. Fabricate all structural steel items in accordance with AISC Specifications and as indicated
4 on the drawings.
- 5 2. Properly mark materials for field assembly. Fabricate for delivery sequence that will expedite
6 erection and minimize handling of materials.
- 7 3. Complete structural steel assemblies before shop priming or galvanizing.

8 B. Architecturally Exposed Structural Steel (AESS):

- 9 1. Fabricate and erect all structural steel items identified on the drawings as AESS in
10 accordance with the AISC Code of Standard Practice for Buildings and Bridges.
- 11 a. Fabricate with exposed surfaces smooth, square, and free of surface blemishes
12 including pitting, rust, scale, seam marks, roller marks, rolled trade names, and
13 roughness.
- 14 b. Remove blemishes by filling or grinding or by welding and grinding, before
15 cleaning, treating, and shop priming.
- 16 2. Prepare AESS surfaces according to the following specifications and standards:
- 17 a. SSPC-SP6 "Commercial Blast Cleaning"

18 C. Shop Connections:

- 19 1. All shop connections shall be welded, unless noted otherwise on drawings. Connections
20 shall develop the full strength of the adjoining members unless detailed otherwise.
- 21 2. All holes shall be either drilled or punched, as no burning of holes will be permitted, including
22 the enlargement of holes. Provide all holes required for connections and for attaching the
23 work of other trades where such holes are shown if furnished prior to fabrication.
- 24 3. Connections shall be detailed as standard framed beam connections (bearing type) in
25 accordance with the AISC Manual of Steel Construction - Allowable Stress Design.
26 Connections which require oversized holes or slotted holes in which the force is other than
27 normal to the axis of the slot shall be detailed as "Slip-Critical Connections" and noted as
28 such on the erection drawings. Provide bearing plates and end anchorage for beams resting
29 on masonry.
- 30 4. All full and partial penetration welds shall be fully detailed on the shop drawings. Use
31 backing for all full penetration welds.
- 32 5. Remove backing bars, runoff tabs or other field welding aids for AESS connections.
- 33 6. Weld access holes shall be fabricated in accordance with the recommendations of AWS
34 D1.1 and AISC Specification.
- 35 7. Coordinate bolt head orientation with architect for AESS connections.

36 D. Shear Connectors:

- 37 1. Shear stud connector for embedded plates and angles shall be welded in the fabrication
38 shop in accordance with AWS D1.1.

39 E. Deck support framing and seats: Furnish all miscellaneous framing necessary to fully support the
40 roof and floor steel decking.

- 1 F. Shop Priming:
- 2 1. Unless noted otherwise below, structural steel shall not be shop primed.
- 3 2. The following are steel surfaces to receive shop priming:
- 4 a. Surfaces outside the building envelope that are not galvanized.
- 5 b. Surfaces to be painted per Architect's drawings.
- 6 3. If the steel pieces are to be shop primed, the following surfaces are exceptions to shop
7 priming:
- 8 a. Surfaces embedded in concrete or mortar. Extend priming of partially embedded
9 members to a depth of 2 inches.
- 10 b. Surfaces to be field welded.
- 11 c. Surfaces to be high-strength bolted with slip-critical connections.
- 12 d. Surfaces to receive sprayed fire-resistive materials.
- 13 e. Galvanized surfaces.
- 14 4. Surface Preparation: Clean Surfaces to be painted. Remove loose rust and mill scale and
15 spatter, slag, or flux deposits. Prepare surfaces according to the following specifications
16 and standards:
- 17 a. SSPC-SP3, "Power Tool Cleaning."
- 18 5. Priming: Apply primer in accordance with paint manufacturer's recommendations, and at a
19 rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use
20 priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
- 21 G. Finished Paint System:
- 22 1. Finished paint coats shall be in accordance with paint manufacturer's recommendations,
23 and specification Division 9.
- 24 2. Paint shall be free of sags, runs, drips or other defects. Allow ample drying time before
25 handling to prevent damage to coatings.
- 26 3. Strip paint corners, crevices, bolts, welds, and sharp edges.
- 27 4. Apply one coat of shop paint to surfaces that will be inaccessible after assembly or erection.
- 28 H. Finished Paint System for Exposed Structural Steel: Structural steel exposed to the elements of
29 weather shall be painted as follows:
- 30 1. Apply one coat of steel primer in shop as specified above.
- 31 2. Apply two coats of alkyd enamel paint to a minimum dry film thickness of 1.5 mils for each
32 coat. Paint shall be applied according to the manufacturer's recommendations.
- 33 3. Paint shall be free of sags, runs, drips or other defects. Allow ample drying time before
34 handling to prevent damage to coatings.

- 1 I. Galvanizing:
- 2 1. Hot-Dip Galvanized Finish: Apply Zinc coating by the hot-dip process to structural steel
3 according to ASTM A 123.
- 4 a. Fill vent holes and grind smooth after galvanizing.
- 5 b. Unless otherwise noted on drawings or in Division 9, all exterior steel components
6 exposed to the elements shall be galvanized, including, but not limited to, lintels.

7 **PART 3 - EXECUTION**

8 **3.1 ERECTION**

- 9 A. Erection Procedures:
- 10 1. The erector and not the structural engineer of record shall be responsible for the means,
11 methods and safety of erection of the structural steel framing.
- 12 2. Erection of all structural steel items shall meet the requirements of AISC "Specification and
13 Code of Standard Practice."
- 14 3. All work shall be erected square, plumb, straight and true, accurately fitted and with tight
15 joints and intersections, by mechanics experienced in the erection of structural steel. Make
16 allowances for difference between temperature at time of erection and mean temperature
17 when structure is completed and in service.
- 18 4. All base plates shall be supported on steel wedges, steel shims or heavy duty leveling nuts
19 until the supported members have been leveled and plumbed.
- 20 a. Snug tighten anchor rods after supported members have been positioned and
21 plumb. Do not remove wedges or shims but, if protruding, cut off flush with edge
22 of base plate before packing with grout.
- 23 b. Promptly place non-shrink grout between bearing surfaces and base plates so no
24 voids remain. Neatly finish exposed surfaces; protect grout and allow to cure.
25 Comply with manufacturers written installation instructions for shrinkage-resistant
26 grouts.
- 27 5. Field connections of structural work shall be made with either high strength bolts (bearing
28 type) or by welding. Proper precaution shall be taken to ensure that anchored items will not
29 be distorted or overstressed due to improperly fabricated items.
- 30 6. Coordinate bolt head orientation with architect for AESS connections.
- 31 7. Splice members only where indicated.
- 32 8. Remove erection bolts on welded, Architecturally Exposed Structural Steel; fill holes with
33 plug welds; and grind smooth at exposed surfaces.
- 34 9. Do not use thermal cutting during erection unless approved by the Engineer/Architect in
35 writing.
- 36 10. Steel erection shall not proceed without concrete in footings, piers, and walls attaining 75%
37 of the intended minimum compressive design strength. Documentation must be provided
38 indicating compliance with this requirement.

- 1 B. Bracing and Protection:
- 2 1. Steel shall be well plumbed, leveled and braced to prevent any movement.
- 3 a. Contractor shall provide and maintain all necessary temporary guying of steel
- 4 frame to resist safely all wind and construction loads during erection and to assure
- 5 proper alignment of all parts of the steel frame.
- 6 2. Provide all temporary flooring, bracing, shoring and guards necessary to prevent damage
- 7 or injury. All partially erected steel shall be secured in an approved manner during
- 8 interruptions of work.
- 9 C. Anchor and Foundation Rods:
- 10 1. All anchor or foundation rods and similar steel items to be built into concrete or masonry are
- 11 to be set by the concrete or masonry contractors and shall be furnished promptly so that
- 12 they may be built in as the work progresses because cutting of structural steel members to
- 13 accommodate errors pertaining to embedded items will not be permitted.

14 **3.2 FIELD WELDING**

- 15 A. Welding Procedures:
- 16 1. All field welding shall be in accordance with AISC Specifications and conform to AWS D1.1
- 17 "Structural Welding Code - Steel".
- 18 a. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges"
- 19 for bearing, adequacy of temporary connections, alignment, and removal of paint
- 20 on surfaces adjacent to field welds.
- 21 b. Assemble and weld built-up sections by methods that will maintain true alignment
- 22 of axes without exceeding tolerances of AISC's "Code of Standard Practice" for
- 23 Steel Buildings and Bridges" for mill material.
- 24 c. Verify that weld sizes, fabrication sequence, and equipment used for
- 25 Architecturally Exposed Structural Steel will limit distortions to allowable
- 26 tolerances. Prevent damage due to field welding on exposed surfaces.
- 27 d. Remove backing bars, runoff tabs or other field welding aids for AESS
- 28 connections.
- 29 e. Close weld access holes at full pen welds for AESS connections.

30 **3.3 REPAIRS, PROTECTION, AND TOUCH UP**

- 31 A. Repair damaged galvanized coatings and on galvanized items with galvanized repair paint according
- 32 to ASTM A 780 and manufacturer's written instructions.
- 33 B. Touch up Painting: After installation, promptly clean, prepare, and prime or reprime field welds, final
- 34 connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates and abutting
- 35 structural steel.
- 36 1. Clean and prepare surfaces by SSPC-SP2 hand-tool cleaning or SSPC-SP3 power-tool
- 37 cleaning.
- 38 2. Apply a compatible primer of the same type as shop primer used on adjacent surfaces.

39 **3.4 GROUTING**

- 40 A. Grouting under structural framing members shall be completed after all members have been plumbed
- 41 and braced and before imposed loads are placed thereon.

1 B. Remove all defective concrete, dirt, oil, grease and other foreign matter from surfaces to which grout
2 will be placed.

3 **3.5 MISCELLANEOUS STEEL AND STEEL LINTELS**

4 A. Furnish and install all miscellaneous steel as detailed in Architectural and Structural Drawings.

5 B. The steel fabricator shall furnish all steel lintels required for masonry wall construction indicated in
6 the Architectural and Structural Drawings and Schedules.

7 C. Provide additional steel framing for continuous support of steel deck edges at openings and column
8 interruptions.

9 D. All exterior exposed steel shall be hot-dip galvanized in accordance with ASTM A123.

10 **END OF SECTION**

SECTION 05 31 00
STEEL DECK

- 1
- 2
- 3 PART 1 – GENERAL
- 4 1.1 DESCRIPTION
- 5 1.2 QUALITY ASSURANCE
- 6 1.3 QUALIFICATIONS
- 7 1.4 SUBMITTALS
- 8 1.5 PRODUCT DELIVERY, STORAGE AND HANDLING
- 9 PART 2 – PRODUCTS
- 10 2.1 STEEL ROOF DECK
- 11 2.2 COMPOSITE FLOOR DECK
- 12 2.3 NONCOMPOSITE FORM DECK
- 13 2.4 FASTENERS
- 14 2.5 ACCESSORIES
- 15 PART 3 – EXECUTION
- 16 3.1 ERECTION
- 17 3.2 ROOF DECK
- 18 3.3 FLOOR DECK
- 19 3.4 FIELD TOUCH UP

20 **PART 1 - GENERAL**

21 **1.1 DESCRIPTION**

- 22 A. The General and Supplementary Conditions of the Construction Contract and Division 1 - General
- 23 Requirements apply to the work specified in this section.

- 24 B. This section includes the fabrication and erection of steel deck. The Work shall include, but not be
- 25 limited to the following:
 - 26 1. Roof deck, roof deck accessories, and roof deck fasteners.
 - 27 2. Composite floor deck.
 - 28 3. Noncomposite form deck.

- 29 C. Structural notes indicated on the drawings regarding steel decking shall be considered a part of this
- 30 specification.

31 **1.2 QUALITY ASSURANCE**

- 32 A. Codes and Standards: Comply with the provisions of the following codes, specifications and
- 33 standards, except where more stringent requirements are shown or specified.
 - 34 1. AISI - Specification for the Design of Cold-Formed Steel Structural Members.
 - 35 2. ANSI/AWS D1.1 - Structural Welding Code.
 - 36 3. ANSI/AWS D1.3 - Structural Welding Code - Sheet Steel.
 - 37 4. ASTM A1008- Standard Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled
 - 38 5. ASTM A36 – Standard Specification for Carbon Structural Steel.
 - 39 6. ASTM A653 - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron
 - 40 Alloy-Coated (Galvannealed) by the Hot Dip Process.
 - 41 7. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-
 - 42 Coated by the Hot-Dip Process

- 1 8. SDI - Design Manual for Composite Decks, Form Decks, Roof Decks by the Steel Deck
2 Institute.
- 3 B. Manufacture steel decking in accordance with the Steel Deck Institute's (SDI) "Design Manual for
4 Composite Decks, Form Decks and Roof Decks".
- 5 C. All steel deck shall be designed and fabricated in accordance with the above AISI and SDI
6 specifications. The gauges and section moduli indicated on the drawings or specified herein are
7 minimum and the gauge and section modules of the deck furnished shall meet or exceed these
8 minimum requirements. All gauges are United States standard, measured prior to coating.
- 9 D. Where any provisions of other pertinent codes and standards conflict with this specification, the more
10 stringent provision shall govern.

11 **1.3 QUALIFICATIONS**

- 12 A. Fabricator: Company specializing in performing the work of this section with minimum five (5) years
13 documented experience at manufacturing steel deck. Fabrication Company shall be a current
14 member of the Steel Deck Institute (SDI).
- 15 B. Erector: Company specializing in performing the work of this section with minimum five (5) years
16 documented experience at erecting steel deck.

17 **1.4 SUBMITTALS**

- 18 A. Prepare and submit shop drawings for Engineer's approval. Shop drawings shall indicate deck
19 layout, depth, uncoated metal thickness, framing and supports with unit dimensions and sections and
20 complete end jointing.
- 21 B. Provide details of all accessories.
- 22 C. Shop drawings shall also indicate typical welding or mechanical anchoring pattern for steel deck and
23 accessories.
- 24 D. Prepare and submit allowable construction span tables and allowable total load tables for Engineer's
25 approval. Tables shall be accompanied with a letter of certification from the manufacturer stating the
26 tabulated design values were determined in accordance with the steel deck institute's "Design
27 Manual for Composite Decks, Form Decks, and Roof Decks."
- 28 E. Provide manufacturer's latest recommendations and installation instructions.
- 29 F. Prepare and submit product data of proposed materials.

30 **1.5 PRODUCT DELIVERY, STORAGE AND HANDLING**

- 31 A. All decking materials shall be transported, stored and erected in a manner that will prevent damage
32 or deformation of sheets. Damaged material shall not be erected or repaired without Structural
33 Engineer's approval.
- 34 B. Deck panels shall be stored clear of the ground, elevated on one end, and protected from weather
35 with waterproof covering.

36 **PART 2 - PRODUCTS**

37 **2.1 STEEL ROOF DECK**

- 38 A. Standard Steel Roof Deck: Fabricate panels to comply with "SDI Specification and Commentary for
39 Steel Roof Deck," and the following:

1 1. Steel decking sheet material, minimum yield strength, depth, gage, profile, and finish are
2 indicated on the Drawings, as classified by Steel Deck Institute (SDI). Panels shall be
3 formed with integral ribs and overlapping side flanges.

4 **2.2 COMPOSITE FLOOR DECK**

5 A. Composite Floor Deck: Fabricate panels with integrally embossed or raised pattern ribs to comply
6 with "SDI Specification and Commentary for Composite Steel Floor Deck," and the following:

7 1. Steel decking sheet material, minimum yield strength, depth, gage, profile, and finish are
8 indicated on the Drawings, as classified by Steel Deck Institute (SDI). Panels shall be
9 formed with integral ribs and overlapping side flanges.

10 **2.3 NONCOMPOSITE FORM DECK**

11 A. Non-Composite Form Deck: Fabricate panels to comply with the "SDI Floor Deck Design Manual,"
12 and the following:

13 1. Steel decking sheet material, minimum yield strength, depth, gage, profile, and finish are
14 indicated on the Drawings, as classified by Steel Deck Institute (SDI). Panels shall be
15 formed with integral ribs and overlapping side flanges.

16 **2.4 FASTENERS**

17 A. Support Fasteners:

18 1. Welded: 5/8" diameter electric arc spot (puddle) welds. Refer to Drawings for weld spacing
19 requirements.

20 a. Weld washers required for material less than 0.028" thick. Welding washers shall
21 a minimum thickness of 0.0598 inches and be applicable to AWS D1.3 type
22 welding and of type as recommended by the deck manufacturer.

23 b. Weld metal shall penetrate all layers of deck material and shall have good fusion
24 to the supporting steel. Fasten ribbed deck to steel support members at ends and
25 intermediate supports.

26 1) All welding shall be in conformance with previously cited AWS
27 recommendations in appearance and quality of welds, and the methods
28 used in correcting welding work.

29 B. Side Lap Fasteners:

30 1. Mechanical: Zinc coated self-drilling, self-tapping type (minimum No. 10) steel screws.
31 Refer to Drawings for fastener spacing requirements.

32 **2.5 ACCESSORIES**

33 A. Provide all closers, fillers, starters, sump pans, metal cant strips, ridge and valley plates, pour stops,
34 column closures, girder fillers, and similar accessories required for a complete installation. Provide
35 cover plates at all locations where direction of deck span changes. Unless otherwise noted,
36 accessories shall be of the same steel sheet material, finish, and thickness as the deck sections.

37 B. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

38 C. Recessed Sump Pans: Single piece steel sheet of same material, finish and thickness as the deck,

1 **PART 3 - EXECUTION**

2 **3.1 ERECTION**

- 3 A. Verify that field conditions are acceptable and are ready to receive work.
- 4 B. Deck units and deck accessories herein specified shall be thoroughly and securely erected by
5 experienced workmen fastening to supporting steel members as herein specified. All work shall be
6 in conformance with manufacturer's latest printed recommendations and approved shop drawings.
- 7 C. Beginning of installation means installer accepts existing conditions.
- 8 D. The finished work shall be true, flat planes and to slopes indicated with end joints flush and without
9 sharp protruding edges. Exposed underside of deck shall be true without defect.
- 10 E. Erector shall cut all openings in deck for piping and equipment furnished by other trades. Wherever
11 ribs are cut and are not supported by supplemental framing, the erector shall provide steel angles of
12 adequate size on all sides of the opening welded to the underside of each rib.
- 13 F. Burning of holes in decking will not be permitted.
- 14 G. Steel decking shall be installed to span supporting steel members at right angles. Panels shall be
15 securely anchored to each structural support it rests on or passes.

16 **3.2 ROOF DECK**

- 17 A. Fasten roof deck panels to steel supporting members using welds as specified herein and on the
18 Drawings.
- 19 B. Unless noted otherwise, secure side laps and perimeter edges of units with fasteners at mid-span
20 between supports or 36 inches on center, whichever distance is smaller.
- 21 C. Deck shall be fastened through the bottom of the deck rib to all structural supports for the specific
22 deck sections.
- 23 D. End bearing of roof decking shall have a minimum of 1-1/2 inches of bearing occurring over structural
24 supports
- 25 E. End joints shall be lapped 2 inches minimum.
- 26 F. Place deck panels on structural supports and adjust to final position with ends aligned. Attach to
27 supports immediately after placement.
- 28 G. Roof sump pans shall be installed over openings provided in roof deck with flanges welded to the top
29 of the deck. Space welds at 12 inches apart with at least 1 weld in each corner.
- 30 H. Install all roof deck accessories in accordance with the roof deck manufacturer's written instructions.

31 **3.3 FLOOR DECK**

- 32 A. Fasten steel floor deck to supporting steel with 5/8" diameter electric arc spot (puddle) welds spaced
33 at 12" O.C. minimum. Secure side laps and perimeter edges of units with fasteners at mid-span
34 between supports or 36 inches on center, whichever distance is smaller.
- 35 B. Place deck panels on structural supports and adjust to final position with ends aligned. Attach to
36 supports immediately after placement.
- 37 C. Install deck ends over supports with a minimum end bearing of 1-1/2 inches.
- 38 D. Non-composite decks end joints shall be lapped a minimum of 2 inches.

1 E. Install pour stops and girder fillers to supporting structure according to manufacturer's
2 recommendations.

3 F. Fasten column closures and cell closures to deck to provide a tight fit. Provide cell closures at
4 changes of direction of deck units, unless otherwise noted.

5 G. Install all floor deck accessories in accordance with the floor deck manufacturer's written instructions.

6 **3.4 FIELD TOUCH UP**

7 A. After erection, all weld burn marks and abraded spots shall be cleaned and field painted with a rust-
8 inhibiting metal primer matching formulations and color of shop coat or a zinc-rich rust inhibiting paint
9 for galvanized deck surfaces.

10 **END OF SECTION**

SECTION 05 40 00

COLD-FORMED STEEL FRAMING (CFSF) SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

1.2 QUALITY ASSURANCE

1.3 SUBMITTALS

1.4 QUALIFICATIONS

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

PART 2 – PRODUCTS

2.1 MATERIALS

2.2 FABRICATION

PART 3 – EXECUTION

3.1 INSPECTION

3.2 INSTALLATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. The General and Supplementary Conditions of the Construction Contract and Division 1 - General Requirements apply to the work specified in this section.

B. Load bearing structural steel stud framing system of 20 to 12 gauge (33 mil to 97 mil) members along with fasteners and related accessories.

C. Furnish and install cold-formed steel framing system as shown on Drawings and herein specified.

1. Work shall include, but not be limited to the following items:

a. Bearing and non-load bearing formed steel stud exterior wall framing.

b. Formed steel joist framing and bridging.

c. Provide tracks, blocking, lintels, clips angles, bridging, shoes, reinforcements, fasteners and accessories to construct a complete steel framing system.

D. Structural notes indicated on Drawings regarding cold-formed steel framing system shall be considered a part of this Specification.

E. Refer to Division 9 for non-load bearing studs of 20 gauge (30 mil) or lighter.

1.2 QUALITY ASSURANCE

A. Workmen Qualifications:

1. For the actual erection of cold-formed steel framing system, use only skilled journeymen steel framing erectors who are thoroughly experienced with the materials and methods specified.

2. Use qualified welders and comply with AWS standards.

B. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. AISI - Specification for the Design of Cold Formed Steel Structural Members, Current Edition.

2. AISI General Provisions 2004 Edition.

- 1 3. AWCI - Association of Wall and Ceiling Industries, Current Edition.
- 2 4. AWS D1.3 - Structural Welding Code - Sheet Steel
- 3 5. ASTM A653 - Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated
4 (Galvannealed) by the Hot Dip Process.
- 5 6. ASTM A1008 -Structural Steel (SS), Sheet, Carbon, Cold-Rolled
- 6 7. ASTM C955 - Load Bearing (Transverse and Axial) Steel Studs, Runners (Track) and
7 Bracing or Bridging for Screw Applications of Gypsum Board and Metal Plaster Base.
- 8 8. ASTM C1007 - Installation of Load Bearing Steel Studs and Related Accessories.
- 9 9. SSMA - Steel Stud Manufacturers Association.
- 10 C. Where any provisions of other pertinent codes and standards conflict with this specification, the more
11 stringent provision shall govern.
- 12 D. Performance Requirement:
- 13 1. Provide CFSF capable of withstanding design loads indicated on the plans.
- 14 2. Design CFSF to withstand design loads meeting the following deflection limits:
 - 15 a. Exterior walls backing up brick or stone veneer: Horizontal deflection of 1/600 of
16 wall height.
 - 17 b. Exterior walls clad with metal siding, exterior insulated finish systems or other
18 flexible non-brittle finishes: Horizontal deflection of 1/360 of wall height.
 - 19 c. Roof joists: Vertical deflection of 1/240 of the span.
- 20 3. Design CFSF to provide for movement of framing members without damage or
21 overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors,
22 or other detrimental effects when subject to a maximum ambient temperature change of
23 120°F.
- 24 4. Design system to accommodate construction tolerances, deflection of building structural
25 members (1 inch maximum), and clearances of intended openings.
- 26 5. CFSF shall be designed in accordance with "Standard for Cold-Formed Steel Framing -
27 General Provisions", current edition.

28 **1.3 SUBMITTALS**

- 29 A. Shop Drawings:
 - 30 1. Prepare and submit complete erection and detailed shop drawings for Engineer's approval,
31 including framing plans indicating size, gauge, weight and location of all framing members.
32 Shop drawings shall indicate the following:
 - 33 a. Component details, framed openings, bearing, anchorage, loading, welds, type
34 and location of fasteners, bracing, bridging, strapping, connections, and
35 accessories or items required of other related work. Provide stud and roof joist
36 layout.
 - 37 b. Describe method for securing studs to tracks and for bolted/welded framing
38 connections.

1 c. Provide calculations for loadings and stresses of steel framing system, including
2 specially fabricated components and roof trusses, shall be prepared by a
3 registered professional engineer, with registration from the state in which the
4 building is located.

5 d. Detail size and location of all bridging, strapping, bracing, splices, and accessories
6 required for installation.

7 B. Product Data:

8 1. Provide product data on standard framing members. Describe materials and finish, product
9 criteria and limitations. Submit manufacturer's installation instructions.

10 **1.4 QUALIFICATIONS**

11 A. MANUFACTURER: Company specializing in performing the work of this section with a minimum of
12 five (5) years documented experience at manufacturing cold-formed steel and framing systems and
13 related accessories. Manufacturer shall be a current and "full" member of the Steel Stud
14 Manufacturers Association (SSMA) or Steel Framing Industry Association (SFIA).

15 B. All steel studs and track furnished under this section shall be supplied by a manufacturer who is a
16 current member of the Steel Stud Manufacturers Association (SSMA) or Steel Framing Industry
17 Association (SFIA).

18 C. Steel studs, headers, and other elements used for this project are sized based on SSMA. Elements
19 of equal or greater capacity may be exchanged.

20 D. Preparation of shop drawings, design calculations, and other structural data by a qualified
21 Professional Engineer licensed in the State of Wisconsin.

22 **1.5 PRODUCT DELIVERY, STORAGE AND HANDLING**

23 A. Steel members shall be transported, stored and erected in a manner that will avoid any damage or
24 deformation. Bent or deformed members will be rejected and shall be replaced or repaired at the
25 expense of the responsible party. Store clear of ground and in such a manner so as to eliminate
26 excessive handling.

27 **PART 2 - PRODUCTS**

28 **2.1 MATERIALS**

29 A. Framing Materials:

30 1. Studs shall conform to the ASTM designations listed in the General Notes of the drawings,
31 unless noted otherwise, and be formed to channel shape, punched web, with nominal size
32 as indicated on Drawings.

33 2. Joists shall conform to the ASTM designations listed in the General Notes of the drawings,
34 unless noted otherwise, and be formed to channel of open box shape, solid or punched web
35 with nominal depths as noted on drawings. All joists shall be single length span (without
36 splices) with a minimum of 8-inch bearing on each end, unless otherwise indicated.

37 3. Track shall be minimum 18 gauge (43 mil) thick sheet steel, channel shaped, solid web,
38 same width as above studs. Track shall provide a tight fit for studs.

39 B. Accessories:

40 1. Bracing, furring and bridging shall consist of formed sheet steel with thickness determined
41 for conditions encountered. Provide manufacturer's standard shapes, complete with finish
42 same as framing members.

1 2. Plates, gussets and clips shall consist of formed sheet steel with thickness determined for
2 conditions encountered. Provide manufacturer's standard shapes, complete with finish
3 same as framing members.

4 C. Fasteners:

5 1. Self-drilling, self-tapping screws, bolts nuts and washers shall conform to ASTM A90,
6 complete with hot-dip galvanized minimum size: 1/4-14.

7 2. Expansion anchors shall be "Kwik" bolts, as manufactured by Hilti, Inc.

8 3. All other fasteners shall be as indicated on Drawings or as recommended by the above stud
9 manufacturer.

10 4. Welding connections are to be performed in accordance with American Welding Society
11 (AWS) D1.3 latest edition "Specification for Welded Sheet Steel in Structures." Consult AWS
12 D19.0 latest edition "Welding Zinc Coated Sheet" and ANSI Standard Z49.1 for information
13 regarding welding procedures.

14 D. Finishes:

15 1. Furnish all studs system components with a factory galvanized (G60) finish.

16 2.2 FABRICATION

17 A. Fabricate assemblies of framed sections, of sizes and profiles required with framing members fitted,
18 reinforced and braced to suit design requirements.

19 B. Fit and assemble in largest practical sections for delivery to Worksite, ready for installation.

20 C. Bearing studs must be fabricated with full stud end seated against track web. Do not use studs that
21 have been cut at punchouts.

22 PART 3 - EXECUTION

23 3.1 INSPECTION

24 A. Verify that substrate surfaces and building framing components are ready to receive work.

25 B. Beginning of installation means acceptance of existing conditions and substrate.

26 3.2 INSTALLATION

27 A. General:

28 1. Cold-formed steel framing system shall consist of structural steel studs and joists with
29 locations as shown on Drawings. All work shall be in accordance with approved shop
30 drawings and manufacturer's latest printed specifications. Framing members shall be
31 securely attached by mechanical fasteners as indicated on Drawings and as recommended
32 by the manufacturer.

33 a. All field welding shall be in accordance with AWS previously cited.

34 b. Wire tying of stud or components in system will not be allowed.

35 c. Complete framing system ready to receive subsequent facing material.

- 1 2. Provision shall be made in studs for rigid fastening of all blocking and special braces or
2 framing and for attachment and support of electrical outlets or other equipment indicated to
3 be supported by stud construction.
- 4 a. All anchorage, bracing and blocking shall be in accordance with approved shop
5 drawings and as recommended by the manufacturer.
- 6 3. Surfaces abraded by handling, weld locations and other miscellaneous defects shall be
7 touched-up with zinc-rich galvanizing compound (ZRC) coating.
- 8 B. Erection Of Studding:
- 9 1. Top and bottom runner members shall be the same size and gauge as the stud and be
10 continuous for the total length of framing system or as long as practical and shall be securely
11 attached a maximum of 24 inches on centers with approved fastening devices. Studs shall
12 extend in one piece full height vertically between runners, spaced no greater than 24 inches
13 on centers, with all web cut-outs in perfect alignment. Studs shall provide solid backing at
14 corners and jambs. Install joists with all components property aligned and braced with all
15 work plumb and true ready and acceptable to receive surface materials.
- 16 a. Coordinate installation of sealant with floor and ceiling tracks.
17 b. Field cutting of studs shall be done by sawing.
18 c. Splices in axial load studs will not be permitted.
19 d. Erect load bearing studs, brace and reinforce to develop full strength to meet
20 design requirements.
21 e. Extend stud framing through ceiling to underside of floor or roof structure above.
22 f. Install intermediate studs above and below openings with studs equally spaced to
23 correspond to adjacent stud spacing.
24 g. Provide deflection allowance in stud track, directly below horizontal building
25 framing for non-load bearing framing.
26 h. Framing fabricator shall ensure punchout alignment when assembling framing and
27 field cutting to length.
28 i. All framing components shall be cut squarely for attachment to perpendicular
29 members.
30 j. In the event a track butt joint occurs within a panel, abutting pieces of track shall
31 be butt welded or spliced together. No such splices shall occur at any head or sill
32 condition.
- 33 2. Steel studs shall be located not more than 2 inches from all door, abutting partitions, partition
34 corners and other construction. Unless detailed otherwise, runner track or stud member
35 shall be used as a runner over door frames. Structural studs and joists shall be securely
36 and rigidly anchored in place to give a total and complete support to subsequent materials
37 attached thereto. All studs shall be securely attached to jamb and head anchor clips of
38 each door frame by manufacturer's recommended method.
- 39 a. Construct corners using minimum three studs. Jamb studs at doors, windows, and
40 other wall openings shall be designed to resist the tributary load of the opening
41 and meet specified performance requirements.
- 42 b. Cold-rolled steel channel stiffeners or bridging shall be provided and installed
43 horizontally every 60 inches in all framing systems through stud web cut-outs with
44 welding clips welded in place at each stud.
- 45 C. Erection Of Joists:
- 46 1. Place joists at spacing indicated on drawings.
- 47 2. Make provisions for erection stresses. Provide temporary alignment and bracing.
- 48 3. Locate joist end bearing directly over load bearing studs or provide load distributing member
49 to top of stud track.

SECTION 05 50 00
METAL FABRICATIONS

- 1
2
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31 **PART 1 - GENERAL**

32 **1.1 SUMMARY**

- 33 A. Section Includes:
- 34 1. Metal fabrications
 - 35 a. Miscellaneous steel framing and supports.
 - 36 b. Shelf angles.
 - 37 c. Miscellaneous steel trim.
 - 38 d. Blackened steel metal panel (**MP-2**)
 - 39 e. Steel wall base (**WB-2**)
 - 40 f. Elevator machine hoist beams.
 - 41 g. Steel shapes for supporting elevator door sills.
 - 42 h. Metal ladders.
 - 43 2. Stainless-steel countertops.
 - 44 3. Rain chains for exterior water catchment.
- 45 B. Products furnished, but not installed, under this Section include the following:
- 46 1. Loose steel lintels.
 - 47 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast
 - 48 into concrete or built into unit masonry.

49 **1.2 COORDINATION**

- 50 A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating
- 51 manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one
- 52 another.
- 53 B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting
- 54 drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor
- 55 bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items
- 56 to Project site in time for installation.
- 57

- 1 **1.3 ACTION SUBMITTALS**
2 A. Product Data: For the following:
3 1. Paint products.
4 2. Grout.
5 B. Sustainable Design Submittals:
6 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and
7 cost.
8 C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of
9 metal fabrications and their connections. Show anchorage and accessory items.
10 D. Samples for Verification: For each type and finish of extruded nosing and tread.
11 E. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a mockup
12 submittal for review.
13 1. Mock-up: Blackened steel metal panel (MP-2).
14 2. Size: Full height in width module with fastener detailed.
15 F. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified
16 professional engineer responsible for their preparation.

- 17 **1.4 INFORMATIONAL SUBMITTALS**
18 A. Qualification Data: For professional engineer.
19 B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with
20 requirements.
21 C. Welding certificates.
22 D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that
23 shop primers are compatible with topcoats.
24 E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

- 25 **1.5 QUALITY ASSURANCE**
26 A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural
27 Welding Code - Steel."
28 B. Welding Qualifications: Qualify procedures and personnel according to the following:
29 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
30 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
31 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

- 32 **1.6 FIELD CONDITIONS**
33 A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal
34 fabrications by field measurements before fabrication.

35 **PART 2 - PRODUCTS**

- 36 **2.1 PERFORMANCE REQUIREMENTS**
37 A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality
38 Requirements," to design ladders.
39 B. Structural Performance of Aluminum Ladders: Aluminum ladders shall withstand the effects of loads and
40 stresses within limits and under conditions specified in ANSI A14.3.
41 C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting
42 on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure
43 of connections, and other detrimental effects.
44 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

- 45 **2.2 METALS**
46 A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal
47 fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks,
48 rolled trade names, or blemishes.
49 B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled
50 content not less than 25 percent.
51 C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

- 1 D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L.
- 2 E. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- 3 F. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

4 **2.3 FASTENERS**

- 5 A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-
- 6 plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls.
- 7 Select fasteners for type, grade, and class required.
- 8 1. Provide stainless-steel fasteners for fastening aluminum.
- 9 2. Provide stainless-steel fasteners for fastening stainless steel.
- 10 B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated;
- 11 galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel.
- 12 Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- 13 C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
- 14 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or
- 15 ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
- 16 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel
- 17 bolts, ASTM F 593, and nuts, ASTM F 594.
- 18 D. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-
- 19 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
- 20 than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-
- 21 plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

22 **2.4 MISCELLANEOUS MATERIALS**

- 23 A. Universal Shop Primer (Interior): Fast-curing, lead- and chromate-free, universal modified-alkyd primer
- 24 complying with MPI#79 and compatible with topcoat.
- 25 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- 26 B. Epoxy Zinc-Rich Primer (Exterior): Complying with MPI#20 and compatible with topcoat.
- 27 C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- 28 D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying
- 29 with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and
- 30 exterior applications.
- 31 E. Concrete for steel bollards, bollard footings: Comply with requirements in Section 03 30 00 "Cast-in-Place
- 32 Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000
- 33 psi.

34 **2.5 FABRICATION, GENERAL**

- 35 A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain
- 36 structural value of joined pieces.
- 37 B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough
- 38 areas on exposed surfaces.
- 39 C. Weld corners and seams continuously to comply with the following:
- 40 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance
- 41 of base metals.
- 42 2. Obtain fusion without undercut or overlap.
- 43 3. Remove welding flux immediately.
- 44 4. At exposed connections, finish exposed welds and surfaces smooth and blended.
- 45 D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where
- 46 possible. Locate joints where least conspicuous.
- 47 E. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide
- 48 weep holes where water may accumulate.
- 49 F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel
- 50 strap anchors not less than 8 inches from ends and corners of units and 24 inches o.c.
- 51

- 1 G. Countertops: Fabricate from 0.062-inch- thick, stainless-steel sheet. Provide smooth, clean exposed tops
2 and edges in uniform plane, free of defects. Provide front and end overhang of 1 inch over the base cabinets.
3 1. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 316L.
4 2. Joints: Fabricate countertops in sections for joining in field, with joints at locations indicated.
5 3. Weld shop-made joints.
6 4. Sound deaden the undersurface with heavy-build mastic coating.
7 5. Extend the top down to provide a 1-inch- thick edge with a 1/2-inch return flange.
8 6. Form the backsplash coved to and integral with top surface, with a 1/2-inch- thick top edge and 1/2-
9 inch return flange.
10 7. Provide raised (marine) edge around perimeter of tops containing sinks; pitch tops containing sinks
11 two ways to provide drainage without channeling or grooving.
12 8. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no
13 evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When
14 polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave
15 surfaces clean.

16 **2.6 MISCELLANEOUS FRAMING AND SUPPORTS**

- 17 A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
18 B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated.
19 Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

20 **2.7 SHELF ANGLES**

- 21 A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide
22 horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches
23 o.c., unless otherwise indicated.
24 B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
25 C. Galvanize shelf angles located in exterior walls.
26 D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place
27 concrete.

28 **2.8 METAL LADDERS (LDR-#)**

- 29 A. General:
30 1. Comply with ANSI A14.3.
31 2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
32 B. Steel Ladders:
33 1. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
34 2. Siderails: Continuous, 1/2-by-2-1/2-inch (12.7-by-64-mm) steel flat bars, with eased edges.
35 3. Rungs: 1-inch- (25-mm-) square steel bars.
36 4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
37 5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules
38 set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
39 6. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or
40 bolted steel brackets.
41 7. Prime exterior ladders, including brackets. **(LDR-2)**
42 8. Prime interior ladders, including brackets and fasteners. **(LDR-1)**

43 **2.9 METALWALL PLATE (MP-2)**

- 44 A. Steel Plate Interior Wall Panels:
45 1. Plate: Rolled Alloys Inc. - Cincinnati
46 2. Alloy Plate: Uncoated, Cold-Rolled Steel Plate: ASTM A 36 commercial steel, exposed.
47 3. Thickness: 1/4 inch.
48 4. Finish: Cold blackening system. Basis - Presto Black by Birchwood Technologies.
49 5. Fasteners: Counter-sunk Black Oxide Screws
50 B. Steel Wall Base **(WB-2)**
51 1. Identical material and finish to interior wall panels.
52 C. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal
53 fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks,
54 rolled trade names, or blemishes.

- 1 **2.10 MISCELLANEOUS STEEL TRIM**
- 2 A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with
- 3 continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where
- 4 possible.
- 5 B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
-
- 6 **2.11 MADISON FIRE DEPARTMENT KNOX BOX**
- 7 A. Key Vaults: A key box shall be installed and incorporated into the entry access bollard as located on plan
- 8 and as detailed. Fabrication and installation shall comply with Madison City Ordinance 918.
- 9 B. Provide and place Fire Department alert decals (e.g. Knox Company stock #1001) on each exterior door or
- 10 door frame of the building near the lock cylinder. Regarding label placement for a group of doors, one label
- 11 for each pair of doors or a group of contiguous doors shall be required.
-
- 12 **2.12 LOOSE BEARING AND LEVELING PLATES**
- 13 A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill
- 14 plates to receive anchor bolts and for grouting.
-
- 15 **2.13 LOOSE STEEL LINTELS**
- 16 A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in
- 17 masonry walls and partitions at locations indicated.
- 18 B. Galvanize loose steel lintels located in exterior walls.
- 19 C. Prime loose steel lintels located in exterior walls with **zinc-rich primer**.
-
- 20 **2.14 STEEL WELD PLATES AND ANGLES**
- 21 A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete
- 22 construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded
- 23 steel strap anchors for embedding in concrete.
-
- 24 **2.15 FINISHES, GENERAL**
- 25 A. Finish metal fabrications after assembly.
-
- 26 **2.16 STEEL AND IRON FINISHES**
- 27 A. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or
- 28 masonry, or unless otherwise indicated.
- 29 B. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
- 30 1. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- 31 2. Other Items: SSPC-SP 3, "Power Tool Cleaning."
-
- 32 **PART 3 - EXECUTION**
-
- 33 **3.1 INSTALLATION, GENERAL**
- 34 A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications.
- 35 Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb,
- 36 true, and free of rack; and measured from established lines and levels.
- 37 B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left
- 38 as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or
- 39 abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or
- 40 screwed field connections.
- 41

- 1 C. Field Welding: Comply with the following requirements:
2 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance
3 of base metals.
4 2. Obtain fusion without undercut or overlap.
5 3. Remove welding flux immediately.
6 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness
7 shows after finishing and contour of welded surface matches that of adjacent surface.
8 D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are
9 required to be fastened to in-place construction.
10 E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or
11 similar construction.

12 **3.2 INSTALLING BEARING AND LEVELING PLATES**

- 13 A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to
14 surfaces. Clean bottom surface of plates.
15 B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been
16 positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush
17 with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces
18 and plates to ensure that no voids remain.

19 **3.3 ADJUSTING AND CLEANING**

- 20 A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas.
21 Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-
22 PA 1 for touching up shop-painted surfaces.

23 **END OF SECTION**

1 SECTION 05 51 13

2 METAL PAN STAIRS

3 PART 1 – GENERAL

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11 [1.1 PERFORMANCE REQUIREMENTS](#)

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16 [1.6 FABRICATION, GENERAL](#)

17 [1.7 STEEL-FRAMED STAIRS](#)

18 [1.8 FINISHES](#)

19 PART 3 – EXECUTION

20 [1.1 INSTALLING METAL PAN STAIRS](#)

21 [1.2 ADJUSTING AND CLEANING](#)

22 PART 1 - **GENERAL**

23 **1.1 RELATED DOCUMENTS**

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

26 **1.2 SUMMARY**

- 27 A. Section Includes:
- 28 1. Preassembled steel pan stairs with precast treads for interior stairs.
 - 29 2. Preassembled steel plate stairs with precast concrete treads for exterior stairs.
 - 30 3. Preassembled steel platforms and landings with concrete-fill.
- 31 B. Related Requirements:
- 32 1. Section 03 30 00 "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
 - 33 2. Section 05 73 00 "Decorative Metal Railings" for interior and exterior stairs.

34 **1.3 COORDINATION**

- 35 A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating
36 manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one
37 another.
- 38 B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions
39 for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors,
40 that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- 41 C. Coordinate locations of hanger rods and struts with other work so that they do not encroach on required stair
42 width and are within the fire-resistance-rated stair enclosure.
- 43

- 1 **1.4 ACTION SUBMITTALS**
- 2 A. Product Data: For metal pan stairs and the following:
- 3 1. Prefilled metal-pan-stair treads.
- 4 2. Precast concrete treads.
- 5 3. Paint products.
- 6 B. LEED Submittals:
- 7 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating
- 8 percentages by weight of postconsumer and preconsumer recycled content. Include statement
- 9 indicating cost for each product having recycled content.
- 10 2. Laboratory Test Reports for Credit IEQ 4.2: For primers, documentation indicating that products
- 11 comply with the testing and product requirements of the California Department of Public Health's
- 12 (formerly, the California Department of Health Services') "Standard Method for the Testing and
- 13 Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental
- 14 Chambers."
- 15 C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- 16 D. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the
- 17 qualified professional engineer responsible for their preparation.
- 18 **1.5 INFORMATIONAL SUBMITTALS**
- 19 A. Welding certificates.
- 20 B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that
- 21 shop primers are compatible with topcoats.
- 22 **1.6 QUALITY ASSURANCE**
- 23 A. Installer Qualifications: Fabricator of products.
- 24 B. Welding Qualifications: Qualify procedures and personnel according to the following:
- 25 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- 26 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

27 **PART 2 - PRODUCTS**

- 28 **2.1 PERFORMANCE REQUIREMENTS**
- 29 A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality
- 30 Requirements," to design stairs and railings.
- 31 B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following
- 32 loads and stresses within limits and under conditions indicated:
- 33 1. Uniform Load: 100 lbf/sq. ft.
- 34 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
- 35 3. Uniform and concentrated loads need not be assumed to act concurrently.
- 36 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads
- 37 specified above.
- 38 5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.
- 39 **2.2 METALS**
- 40 A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For
- 41 components exposed to view in the completed Work, provide materials without seam marks, roller marks,
- 42 rolled trade names, or blemishes.
- 43 B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled
- 44 content not less than 25 percent.
- 45 C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- 46 D. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural
- 47 steel, Grade 30, unless another grade is required by design loads.
- 48

- 1 **2.3 FASTENERS**
2 A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class
3 Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade,
4 and class required.
5 B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and,
6 where indicated, flat washers.
7 C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where
8 indicated, flat washers.
9 1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for exterior stairs.
10 D. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load
11 equal to six times the load imposed when installed in unit masonry and four times the load imposed when
12 installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified
13 independent testing agency.
14 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or
15 ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
16 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel
17 bolts, ASTM F 593, and nuts, ASTM F 594.

- 18 **2.4 MISCELLANEOUS MATERIALS**
19 A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the
20 California Department of Public Health's (formerly, the California Department of Health Services) "Standard
21 Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using
22 Environmental Chambers."
23 B. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting" and Section 099123
24 "Interior Painting."
25 C. Universal Shop Primer (Interior): Fast-curing, lead- and chromate-free, universal modified-alkyd primer
26 complying with MPI#79 and compatible with topcoat.
27 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
28 D. Zinc-Rich Primer (Exterior): Comply with SSPC-Paint 20, Type II, Level 2, and compatible with topcoat.
29 E. Concrete Materials and Properties: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete"
30 for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000
31 psi unless otherwise indicated.

- 32 **2.5 PRECAST CONCRETE TREADS**
33 A. Basis of Design: Tectura Design C-30 Tread With Setting Bed as manufactured by Wausau Tile, Inc.
34 B. Materials:
35 1. Portland Cement: ASTM C-150 specifications for Portland Cement.
36 2. Aggregates: All aggregates to meet ASTM C-33 specifications, cleaned and properly graded to size.
37 Aggregates shall be blended to meet individual project requirements.
38 3. Coloring: Pigments used shall be inorganic, resistant to alkalinity and used per manufacturer's
39 recommendations.
40 4. Reinforcement and Hardware
41 a. To conform with ACI and manufacturer's design.
42 b. Reinforce precast with deformed rods or wire, or both, as recommended by precast concrete
43 manufacturer.
44 5. Sealer: Colorless, pure acrylic water-repellent penetrating sealer. Sealer to maintain natural look of
45 concrete surface with no glaze or gloss, darkening or color change.
46 6. Abrasive Strip: Abrasive filled mixture in routed strips as indicated.
47 7. Concrete Bonding Agent: Steel surface to receive precast is to be primed.
48 8. Setting Bed: Epoxy thinsset shall be used over steel substrate.

- 49 **2.6 FABRICATION, GENERAL**
50 A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing
51 plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
52 1. Join components by welding unless otherwise indicated.
53 2. Use connections that maintain structural value of joined pieces.
54 B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as
55 necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated
56 installation.

- 1 C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of
2 approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
3 D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing
4 work.
5 E. Form exposed work with accurate angles and surfaces and straight edges.
6 F. Weld connections to comply with the following:
7 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance
8 of base metals.
9 2. Obtain fusion without undercut or overlap.
10 3. Remove welding flux immediately.
11 4. Weld exposed corners and seams continuously unless otherwise indicated.
12 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish
13 Standards" for Type 3 welds: partially dressed weld with spatter removed.
14 G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
15 Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise
16 indicated. Locate joints where least conspicuous.

17 **2.7 STEEL-FRAMED STAIRS**

- 18 A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs"
19 in NAAMM AMP 510, "Metal Stairs Manual," Commercial Class, unless more stringent requirements are
20 indicated.
21 B. Stair Framing:
22 1. Fabricate stringers of steel plates or channels as detailed.
23 a. Provide closures for exposed ends of channel stringers.
24 2. Construct platforms of steel plate or channel headers and miscellaneous framing members as
25 needed to comply with performance requirements.
26 3. Weld stringers to headers; weld framing members to stringers and headers.
27 4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting
28 steel stair components before installing masonry.
29 C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of
30 thickness needed to comply with performance requirements, but not less than 0.067 inch.
31 1. Interior Steel Sheet: Uncoated hot-rolled steel sheet.
32 2. Exterior Steel Sheet: Galvanized-steel sheet.
33 3. Directly weld metal pans to stringers; locate welds on top of subtreads where they are concealed by
34 concrete fill. Do not weld risers to stringers.
35 4. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld
36 subplatforms to platform framing.
37 D. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous
38 fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and
39 other anchorage devices for connecting to concrete or masonry work.

40 **2.8 FINISHES**

- 41 A. Finish metal stairs after assembly.
42 B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power
43 Tool Cleaning."
44 C. Apply shop primer to uncoated surfaces of metal stair components, except those to be embedded in concrete
45 or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1:
46 Shop, Field, and Maintenance Painting of Steel," for shop painting.

47 **PART 3 - EXECUTION**

48 **3.1 INSTALLING METAL PAN STAIRS**

- 49 A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing
50 metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-
51 bolts, lag bolts, and other connectors.
52 B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set
53 units accurately in location, alignment, and elevation, measured from established lines and levels and free
54 of rack.
55 C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless
56 otherwise indicated.

- 1 D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or
- 2 similar construction.
- 3 E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left
- 4 as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or
- 5 abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or
- 6 screwed field connections.
- 7 F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- 8 G. Install precast concrete treads by welding precast tread to plate subtread.
- 9 H. Installation Of Precast Treads - Thinset Application:
 - 10 1. Substrate of steel (steel at interior application only) shall be within a tolerance of 1/8 inch in all
 - 11 dimensions.
 - 12 2. Steel surface to receive precast is to be primed with a concrete bonding agent.
 - 13 3. Epoxy thinset is used over steel substrate.
 - 14 4. Set treads level and plumb to meet finished nosing layout marks.

15 **3.2 ADJUSTING AND CLEANING**

- 16 A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of
- 17 shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA
- 18 1 for touching up shop-painted surfaces.
 - 19 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

20 **END OF SECTION 05 51 13**

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SECTION 05 73 00
DECORATIVE METAL RAILINGS

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26 **PART 1 - GENERAL**

27 **1.1 RELATED DOCUMENTS**

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

30 **1.2 SUMMARY**

- 31 A. Section Includes:
32 1. Steel guardrails at exterior stairs **(GDRL-1)**.
33 2. Stainless Steel handrails at interior stairs **(HDRL-1)**.
34 3. Steel gate at outdoor classroom.
35 B. Related Sections:
36 1. Section 06 20 23 "Interior Finish Carpentry" for wood rail cap.

37 **1.3 DEFINITIONS**

- 38 A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas
39 and for pedestrian guidance and support, visual separation, or wall protection.

40 **1.4 COORDINATION AND SCHEDULING**

- 41 A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating
42 manufacturers' written instructions to ensure that shop primers and topcoats are compatible.
43 B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for
44 installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that
45 are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.
46 C. Schedule installation so wall attachments are made only to completed walls. Do not support railings
47 temporarily by any means that do not meet structural performance requirements.

48 **1.5 PREINSTALLATION MEETINGS**

- 49 A. Preinstallation Conference: Conduct conference at Project site.
50

- 1 **1.6 ACTION SUBMITTALS**
2 A. Product Data: For the following:
3 1. Manufacturer's product lines of railings assembled from standard components.
4 2. Grout, anchoring cement, and paint products.
5 B. Sustainable Design Submittals:
6 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and
7 cost.
8 C. Shop Drawings: Include plans, elevations, sections, and attachment details.
9 D. Samples: For each type of exposed finish required.
10 E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and
11 design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in
12 the State of Wisconsin responsible for their preparation.
- 13 **1.7 INFORMATIONAL SUBMITTALS**
14 A. Qualification Data: For professional engineer.
15 B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency,
16 according to ASTM E 894 and ASTM E 935.
17 C. Preconstruction test reports.
18 D. Evaluation Reports: For post-installed anchors, from ICC-ES.
- 19 **1.8 QUALITY ASSURANCE**
20 A. Welding Qualifications: Qualify procedures and personnel according to the following:
21 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
22 2. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."
23 B. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a mockup
24 submittal for review.
25 1. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate
26 aesthetic effects, and to set quality standards for fabrication and installation.
27 a. New exterior railing GDRL-1 installation detail at Level 2 roof terrace.
28 b. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area,
29 and anchorage system components.
30 c. Subject to compliance with requirements, approved mockups may become part of the
31 completed Work if undisturbed at time of Substantial Completion.
- 32 **1.9 FIELD CONDITIONS**
33 A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field
34 measurements before fabrication and indicate measurements on Shop Drawings.

35 **PART 2 - PRODUCTS**

- 36 **2.1 MANUFACTURERS**
37 A. Steel and Iron Decorative Railings:
38 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products
39 that may be incorporated into the Work include, but are not limited to the following:
40 a. Architectural Iron Designs, Inc.
41 b. Blum, Julius & Co., Inc.
42 c. Braun, J. G., Company; The Wagner Companies.
43 B. Product Options: Information on Drawings and in Specifications establishes requirements for system's
44 aesthetic effects and performance characteristics.
45 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's
46 approval.
47

- 1 **2.2 PERFORMANCE REQUIREMENTS**
- 2 A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality
- 3 Requirements," to design railings, including attachment to building construction.
- 4 B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects
- 5 of gravity loads and the following loads and stresses within limits and under conditions indicated:
- 6 1. Handrails and Top Rails of Guards:
- 7 a. Uniform load of 50 lbf/ft. applied in any direction.
- 8 b. Concentrated load of 200 lbf applied in any direction.
- 9 c. Uniform and concentrated loads need not be assumed to act concurrently.
- 10 2. Infill of Guards:
- 11 a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
- 12 b. Infill load and other loads need not be assumed to act concurrently.
- 13 **2.3 METALS, GENERAL**
- 14 A. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.
- 15 B. Wood Handrail:
- 16 C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled
- 17 content not less than 25 percent.
- 18 **2.4 STEEL GUARD RAILS AND HANDRAILS**
- 19 A. Stainless Steel Tubing: ASTM A 554, Grade MT 304 (Interior).
- 20 B. Stainless Steel Tubing: ASTM A 554, Grade MT 316L (Exterior).
- 21 C. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.
- 22 D. Plates, Shapes, and Bars: ASTM A 36/A 36M
- 23 E. Refer to the drawings for extent and profiles.
- 24 F. Woven-Wire Mesh: Intermediate-crimp, diamond and square pattern, 2-inch (50-mm) woven-wire mesh,
- 25 made from 0.135-inch (3.5-mm) nominal diameter wire complying with ASTM A510/A510M. Clinched "U"
- 26 channel on all sides.
- 27 **2.5 FASTENERS**
- 28 A. Fastener Materials: Unless otherwise indicated, provide the following:
- 29 1. Uncoated Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25
- 30 for electrodeposited zinc coating where concealed; Type 304 stainless-steel fasteners where
- 31 exposed.
- 32 3. Dissimilar Metals: Type 316 stainless-steel fasteners.
- 33 B. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load,
- 34 according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.
- 35 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or
- 36 ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
- 37 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel
- 38 bolts, ASTM F 593, and nuts, ASTM F 594.
- 39 **2.6 MISCELLANEOUS MATERIALS**
- 40 A. Interior Materials:
- 41 1. Shop Primers: Provide primers that comply with Section 09 91 23 "Interior Painting.
- 42 a. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer
- 43 complying with MPI#79 and compatible with topcoat.
- 44 2. Top Coat: Field applied. Refer to Section 09 91 23 for field applied topcoats.
- 45 B. Exterior Materials:
- 46 1. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with intermediate and topcoat.
- 47 2. Intermediate and Top Coat: Field applied. Refer to Section 09 91 13 for field applied topcoats.
- 48 C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying
- 49 with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and
- 50 exterior applications.
- 51

- 1 **2.7 FABRICATION**
- 2 A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and
- 3 spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- 4 B. Connections: Fabricate railings with welded connections unless otherwise indicated.
- 5 C. Welded Connections: Cope components at connections to provide close fit. Weld all around at connections,
- 6 including at fittings.
- 7 1. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish
- 8 Standards" for Type 1 welds; no evidence of a welded joint.
- 9 D. Form changes in direction by bending
- 10 E. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section
- 11 of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed
- 12 surfaces of components.
- 13 F. Close exposed ends of hollow handrail members with prefabricated end fittings.
- 14 G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.
- 15 H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors
- 16 to interconnect railing members to other work unless otherwise indicated.
- 17 **2.8 STEEL AND IRON FINISHES**
- 18 A. Preparing Nongalvanized Items for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with
- 19 SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning.
- 20 B. Interior Finishes: Apply Universal Primer.
- 21 C. Exterior Applications: Apply zinc rich primer.

22 **PART 3 - EXECUTION**

- 23 **3.1 INSTALLATION**
- 24 A. Fit exposed connections together to form tight, hairline joints.
- 25 B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location,
- 26 alignment, and elevation; measured from established lines and levels and free of rack.
- 27 1. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
- 28 2. Align rails so variations from level for horizontal members and variations from parallel with rake of
- 29 steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- 30 C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other
- 31 materials from direct contact with incompatible materials.
- 32 1. Coat concealed surfaces that will be in contact with grout, concrete, masonry, wood, or dissimilar
- 33 metals, with a heavy coat of bituminous paint.
- 34 **3.2 CLEANING**
- 35 A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of
- 36 shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-
- 37 PA 1 for touching up shop-painted surfaces.
- 38 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- 39 **3.3 PROTECTION**
- 40 A. Protect finishes of railings from damage during construction period with temporary protective coverings
- 41 approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- 42 B. Restore finishes damaged during installation and construction period so no evidence remains of correction
- 43 work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish
- 44 entire unit, or provide new units.

45 **END OF SECTION**

1

SECTION 05 94 43

2

STAINLESS STEEL TRELLIS SYSTEM

3PART 1 – GENERAL

- 4 1.1 SECTION INCLUDES
- 5 1.2 RELATED SECTIONS
- 6 1.3 REFERENCES
- 7 1.4 DESIGN / PERFORMANCE REQUIREMENTS
- 8 1.5 SUBMITTALS
- 9 1.6 QUALITY ASSURANCE
- 10 1.7 DELIVERY, STORAGE, AND HANDLING
- 11 1.8 PROJECT CONDITIONS

12PART 2 – PRODUCTS

- 13 2.1 MANUFACTURERS
- 14 2.2 ASSEMBLIES
- 15 2.3 WALL MOUNTING SPACERS/BRACKETS
- 16 2.4 WIRE ROPE
- 17 2.5 FITTINGS
- 18 2.6 FINISH
- 19 2.7 FABRICATION

20PART 3 – EXECUTION

- 21 3.1 EXAMINATION
- 22 3.2 PREPARATION
- 23 3.3 INSTALLATION
- 24 3.4 ADJUSTING AND CLEANING
- 25 3.5 PROTECTION

26PART 1 - **GENERAL**

27 **1.1 SECTION INCLUDES**

- 28 A. Stainless trellis system (**TS-1**) assemblies including.
- 29 1. Vertical wire ropes.

30 **1.2 RELATED SECTIONS**

- 31 A. Section 03 30 00 - Cast-in-Place Concrete.
- 32 B. Section 04 40 00 - Stone Assemblies.
- 33 C. Section 05 50 00 - Metal Fabrications.
- 34 D. Section 06 10 00 - Rough Carpentry.

35 **1.3 REFERENCES**

- 36 A. American Iron and Steel Institute (AISI) - Steel Product Manual; Stainless and Heat Resisting Steel.
- 37 B. ASTM A 276 - Stainless and Heat-Resisting Steel Bars and Shapes.
- 38 C. ASTM A 380 - Practice for Cleaning and Descaling Stainless Steel Parts, Equipment and Systems.
- 39 D. ASTM A 492 - Specification for Stainless Steel Rope Wire.
- 40 E. ASTM A 555 - Stainless Steel Wire.
- 41 F. ASTM A 582 - Specification for Free-Machining Stainless and Heat-Resisting Steel Bars.
- 42 G. ASTM B 912 - Specification for Passivation of Stainless Steels Using Electropolishing.
- 43 H. ASTM F 1145 - Specification for Turnbuckles, Swaged, Welded, Forged.
- 44 I. MIL-C-5688 - Pre-Stretching and Proof-Testing of Wire Rope Assemblies.

45 **1.4 DESIGN / PERFORMANCE REQUIREMENTS**

- 46 A. Structural Requirements: Provide stainless steel trellis systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated on the Drawings:
 - 47 1. Components: Design and size to withstand dead and live loads of components, plants, rain,
 - 48 snow and ice and loads caused by positive and negative wind pressure acting normal to plane
 - 49 of trellis as calculated in accordance with applicable code.
 - 50
 - 51

- 1 B. Trellis systems shall be designed, fabricated, and installed to accommodate expansion and
2 contraction of metal components without causing undue stress, buckling, opening of joints, and
3 distortion.
4 C. Design supports and hardware to withstand loads encountered without excessive deflection or
5 distortion when cables are tensioned to required amounts required to conform to applicable building
6 codes.

7 **1.5 SUBMITTALS**

- 8 A. Submit under provisions of Section 01 30 00.
9 B. Product Data: Provide manufacturer's standard catalog data for specified products demonstrating
10 compliance with referenced standards. Provide list of fittings being provided with descriptions, load
11 capabilities, and either photographs or drawings for each type.
12 C. Shop Drawings: Submit Shop Drawings for fabrication and installation. Include the following:
13 1. Plans, elevations, and detail sections.
14 2. Indicate materials, methods, finishes, fittings, fasteners, anchorages, and accessory items.
15 3. Provide setting diagrams and templates for anchorages, sleeves, and bolts to be installed by
16 others.
17 4. Where materials or fabrications are indicated to comply with design loadings, include material
18 and safety factor properties, and other information needed for structural analysis.
19 D. Verification Samples: Two samples representing actual products and finishes as follows:
20 1. Wire rope with fitting, minimum size 12 inches (300 mm) long.
21 2. Typical fittings.
22 E. Installation Instructions: Manufacturer's printed installation instructions.
23 F. Operation and Maintenance Data: Include methods for maintaining installed products and precautions
24 against cleaning materials and methods detrimental to finishes and performance.
25 G. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

26 **1.6 QUALITY ASSURANCE**

- 27 A. Manufacturer Qualifications: Company specializing in manufacturer of stainless steel wire rope,
28 fittings, and other stainless steel components with 10 years minimum successful experience.
29 B. Installer Qualifications: Experienced in performing work of this section that has specialized in
30 installation of work similar to that required for this project.
31 C. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a
32 mockup submittal for review.
33 D. Mock-Up: Provide a mock-up for evaluation of preparation techniques and installation workmanship.
34 1. Locate in areas designated by Architect.
35 2. Size: Full height by 2 modules wide showing end condition.
36 3. Do not proceed with remaining work until workmanship is approved by Architect.
37 4. Rework mock-up as required to produce acceptable work.
38 5. Retain mock-up during construction as quality standard.
39 6. Remove and legally dispose of mock-up when no longer needed.
40 7. Incorporation: Incorporate mock-up into final construction.
41 E. Preinstallation Meetings: Conduct meetings including Contractor, Architect, fabricator, installer and
42 other subcontractors whose work involves cable trellis system to verify project requirements, framing
43 and support conditions, mounting surfaces and manufacturer's installation. Comply with Division 1
44 requirements.

45 **1.7 DELIVERY, STORAGE, AND HANDLING**

- 46 A. Store products in manufacturer's unopened packaging until ready for installation.
47 B. Handle and store products according to manufacturer's recommendations. Leave products wrapped
48 or otherwise protected and under clean and dry storage conditions until required for installation.
49 C. Exercise care not to scratch, mark, dent, or bend metal components during delivery, storage, and
50 installation.
51

1 **1.8 PROJECT CONDITIONS**

- 2 A. Verify actual openings by field measurements before fabrication; show recorded measurements on
3 shop drawings.
4 B. Coordinate field measurements and fabrication schedule with construction progress to avoid
5 construction delays.

6PART 2 - PRODUCTS

7 **2.1 MANUFACTURERS**

- 8 A. Acceptable Manufacturer: Jakob Rope Systems, which is located at: 955 N. W. 17th Ave. Unit B ;
9 Delray Beach, FL 33445; Toll Free Tel: 866-215-1421; Tel: 561-330-6502; Fax: 561-330-6508; Email:
10 request info (info@jakob-usa.com); Web: www.jakob-usa.com
11 B. Substitutions: Not permitted.
12 C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.
13 D. Provide all cable, materials, fittings and components from a single manufacturer.

14 **2.2 ASSEMBLIES (TS-1)**

- 15 A. Provide Jakob, Inc. INOX Line stainless steel climbing plant trellis structures and mounting as
16 indicated on the Drawings. Manufacturer shall engineer and fabricate components and assemblies for
17 installation.
18 B. Green Facades: Stainless steel climbing plant trellis structure and mountings.
19 1. Purpose: Training system for plants as indicated on Drawings.

20 **2.3 WALL MOUNTING SPACERS/BRACKETS**

- 21 A. Provide wall mounting spacers, brackets and fittings required for attachment and connection to the
22 structure and for support of stainless steel wire rope, wire netting, metal rod and wood rod infill as
23 indicated on the Drawings.
24 B. Spacer Clearance and Load:
25 1. Wall Clearance: 3.2 inches.
26 2. Spacer layout as selected by manufacture to suit application and design requirements
27 specified.
28 C. Mounting Types: Fabricate from AISI Type 316 and 316L stainless steel complying with ASTM F
29 1145; INOX Line anchors as manufactured by Jakob, Inc. Provide sizes and types as required to meet
30 project design conditions specified and indicated on Drawings including:
31 1. Through Hole: Headless screw with nut and check nut on the back and a from ring nut with
32 support washer on the front.
33 D. Stainless Steel Bars and Shapes: Type 316 stainless steel conforming to ASTM A 276. Provide sizes
34 and shapes as required to meet project design conditions specified and indicated on Drawings.

35 **2.4 WIRE ROPE**

- 36 A. Material: ASTM A 492 and ASTM A 555, Type 316 stainless steel. Fabricate wire rope with integral
37 colored filament designating specific manufacturer.
38 B. Length: Provide wire rope tendons in lengths indicated on Drawings and approved shop drawings.
39 1. Provide optimum adjustment in both directions by calculating final tendon lengths with
40 allowance for tensioning fittings with 2/3 open and with 1/3 of thread length engaged.
41 2. Measure tendon length from center of pin to center of pin, or center of eye to center of eye.
42

- 1 **2.5 FITTINGS**
- 2 A. Provide fittings required for attachment and connection of stainless steel wire rope, wire netting, metal
- 3 rods and/or wood rod infill to support framework and substrates.
- 4 B. Fitting minimum breaking strength:
- 5 1. As selected by manufacture to suit application and design requirements specified.
- 6 C. Types: Fabricate from AISI Type 316 and 316L stainless steel complying with ASTM F 1145; INOX
- 7 Line Fittings as manufactured by Jakob, Inc. Provide sizes and types as required to meet project
- 8 design conditions specified and indicated on Drawings and reviewed shop drawings including:
- 9 D. Accessories: Provide threaded couplings, tensioning screws, cover disks, eye bolts, eye nuts,
- 10 carabineers, shackles, clips, welded rings, screws, washers, lock nuts, hexagonal nuts, dome nuts,
- 11 wall anchors, screws, and wire end caps as required to complete the installation.
- 12 **2.6 FINISH**
- 13 A. After fabrication, clean and de-scale stainless steel wire rope, fittings, and other components in
- 14 accordance with ASTM A 380.
- 15 B. Finish components with AISI No. 4 brushed satin finish in accordance with ASTM B 912.
- 16 **2.7 FABRICATION**
- 17 A. Tolerances: Verify dimensions on site prior to shop fabrication.
- 18 B. Fabricate stainless steel in accordance with AISI Steel Product Manual and the manufacturers
- 19 requirements.
- 20 C. Shop fabricate to designs indicated on Drawings and to meet performance requirements specified.
- 21 D. Shop fabricate fittings, interfacing parts and assemblies so that field cutting adjustments are not
- 22 necessary.
- 23 E. Coordinate requirements, dimensions and spacings of trellis system to ensure required factory drilled
- 24 holes in supporting framework are correctly located.
- 25 F. Make exposed joints butt, flush, and hairline.
- 26 G. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep
- 27 holes where water may accumulate.

28PART 3 - EXECUTION

- 29 **3.1 EXAMINATION**
- 30 A. Before beginning installation, verify that conditions installed under other sections are acceptable for
- 31 installation of cable trellis systems in accordance with manufacturer's installation instructions.
- 32 B. Verify supporting system for stainless steel wire rope trellis is prepared for attachment of anchors,
- 33 fittings, wire rope, and wire netting and transfer of calculated loads.
- 34 C. If conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation
- 35 before proceeding.
- 36 **3.2 PREPARATION**
- 37 A. Verify alignment, support dimensions, and tolerances are correct.
- 38 B. Inventory components to ensure all required items are available for installation. Inspect components
- 39 for damage. Remove damaged components from site and replace.
- 40 **3.3 INSTALLATION**
- 41 A. Install wire rope trellis system in accordance with manufacturer's instructions and the approved shop
- 42 drawings.
- 43 B. Provide anchorage devices and fittings to secure to in-place construction; including threaded fittings
- 44 for concrete inserts, toggle bolts and through-bolts.
- 45 C. Install infill plumb, level, square, and rigid without kinks or sags.
- 46 D. Anchor trellis system to mounting surfaces as indicated on the Drawings.
- 47 E. Separate dissimilar materials with bushings, grommets or washers to prevent electrolytic corrosion.
- 48 F. Use manufacturer's supplied cable hardware.
- 49 G. Ensure cables are clean, parallel to each other, and without kinks or sags.
- 50 H. Tension cable with hand or hydraulic equipment so that no slack is visible.
- 51 I. After final adjustment provide tamper resistant Loctite materials on all fittings.
- 52 **3.4 ADJUSTING AND CLEANING**
- 53 A. Adjust wire rope tension and connecting hardware.

- 1 B. Remove temporary coverings and protection of adjacent work areas. Clean installed products in
- 2 accordance with manufacturer's instructions before owner's acceptance.
- 3 C. Do not use abrasive cleaners.
- 4 D. Remove from project site and legally dispose of construction debris associated with this work.

5 **3.5 PROTECTION**

- 6 A. Protect installed products until completion of project.
- 7 B. Touch-up, repair or replace damaged products before Substantial Completion.
- 8 C. Protect installed products and finished surfaces from damage during construction.
- 9 D. Replace defective or damaged components as directed by Architect.

10

END OF SECTION

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SECTION 06 10 00
ROUGH CARPENTRY

- 1
- 2
- 3 PART 1 – GENERAL
- 4 1.1 DESCRIPTION
- 5 1.2 QUALITY ASSURANCE
- 6 1.3 PRODUCT DELIVERY, STORAGE AND HANDLING
- 7 1.4 SUBMITTALS
- 8 PART 2 – PRODUCTS
- 9 2.1 MATERIALS
- 10 2.2 DIMENSIONAL LUMBER
- 11 2.3 ENGINEERED LUMBER
- 12 2.4 WOOD-PRESERVATIVE-TREATED MATERIALS
- 13 2.4 ROOF SHEATHING
- 14 2.6 MISCELLANEOUS LUMBER
- 15 2.7 MISCELLANEOUS FASTENING REQUIREMENTS
- 16 2.8 FASTENERS
- 17 PART 3 – EXECUTION
- 18 3.1 INSTALLATION, GENERAL
- 19 3.2 WOOD BLOCKING, AND NAILER INSTALLATION
- 20 3.3 WOOD FRAMING INSTALLATION, GENERAL

21 **PART 1 - GENERAL**

22 **1.1 DESCRIPTION**

- 23 A. The General and Supplementary Conditions of the Construction Contract and Division 1 - General
- 24 Requirements apply to the Work specified in this section.

- 25 B. This section includes dimensional lumber, engineered wood products, APA rated sheathing and
- 26 wood blocking.

- 27 C. This section also includes appropriate anchoring and/or fastening devices for wood members, as well
- 28 as acceptable wood treatment.

- 29 D. Structural notes indicated on the drawings regarding lumber shall be considered a part of this
- 30 specification.

31 **1.2 QUALITY ASSURANCE**

- 32 A. Codes and Standards: Comply with the provisions of the following codes, specifications, and
- 33 standards except where more stringent requirements are shown or specified.

- 34 1. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip), on Iron and Steel Hardware
- 35 2. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile
- 36 Strength

- 37 3. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts

- 38 4. ASTM A653 - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron
- 39 Alloy-Coated (Galvannealed) by the Hot Dip Process

- 40 5. ASTM D245 - Standard Practice for Establishing Structural Grades and Related Allowable
- 41 Properties for Visually Graded Lumber

- 42 6. AWPA P5 - Standard for Waterborne Preservatives

- 43 7. AWPA T1 - Processing and Treatment Standard

- 1 8. AWPA U1 - User Specification for Treated Wood
- 2 9. ICC Evaluation Report ESR-1721
- 3 10. NDS - American Forest & Paper Association National Design Specification
- 4 11. PRP-108 - American Plywood Association Performance Standards and Qualification Policy
5 for Structural-Use Panels
- 6 12. PS 1 - National Institute of Standards and Technology Voluntary Product Standard for
7 Structural Plywood
- 8 13. PS 2 - National Institute of Standards and Technology Voluntary Product Standard for
9 Wood-Based Structural-Use Panels
- 10 14. PS 20 - National Institute of Standards and Technology Voluntary Product Standard for
11 Softwood Lumber
- 12 B. Engineered Wood Products: Obtain each type of engineered wood product through one source from
13 a single manufacturer.

14 **1.3 PRODUCT DELIVERY, STORAGE AND HANDLING**

- 15 A. All lumber shall be delivered, piled and handled so as to protect it from warping due to excessive
16 moisture or damage. Lumber shall be stored off the ground and under a waterproof cover properly
17 fastened down to resist wind forces.
- 18 B. All installed exposed wood roof nailers, cants, curbs, and similar items shall be protected from
19 moisture until covered with subsequent roofing materials or flashings.

20 **1.4 SUBMITTALS**

- 21 A. Submit product data for each distinct product specified.
- 22 B. Material certificates for dimensional lumber specified to comply with minimum allowable unit stresses
23 indicated on the documents. Indicate species and grade selected for each use, and design values
24 approved by American Lumber Standards Committee.
- 25 C. Wood treatment data as follows, including chemical treatment manufacturer's warranty and
26 instructions for handling, storing, installing, and finishing treated materials:
- 27 1. For each type of preservative-treated wood product, include certification by treating plant
28 stating type of preservative solution and pressure process used, net amount of preservative
29 retained, and compliance with applicable standard.
- 30 2. For waterborne-treated products, include statement that moisture content of treated
31 materials was reduced to levels indicated before shipment to the project site.

32 **PART 2 - PRODUCTS**

33 **2.1 MATERIALS**

- 34 A. Lumber Standards:
- 35 1. Dimensional Lumber: Comply with PS 20 and with applicable grading rules of inspection
36 agencies certified by ALSC's Board of Review.

- 1 a. Each piece of lumber to be factory marked with grade, producing mill and the
2 agency providing inspection services. Where exposed lumber is indicated to have
3 a natural finish or receive stain, grade stamp to be located on the end or back of
4 each piece.
- 5 b. Moisture content not to exceed 19% for kiln-dry or air-dry lumber.
- 6 2. Wood Structural Panels: Comply with PS 1 or PS 2.
- 7 B. Grade and Species:
- 8 1. Provide dimensional lumber of any species, graded visually or mechanically, and capable
9 of supporting required loads without exceeding allowable design values according to
10 AF&PA's "National Design Specification for Wood Construction" and its "Supplement."
- 11 C. Lumber grading rules shall be obtained from one of the following agencies:
- 12 1. NELMA - Northeastern Lumber Manufacturers Association.
13 2. NLGA - National Lumber Grades Authority.
14 3. NSLB - Northern Softwood Lumber Bureau.
15 4. RIS - Redwood Inspection Services.
16 5. SPIB - Southern Pine Inspection Bureau.
17 6. WCLIB - West Coast Lumber Inspection Bureau.
18 7. WWPA - Western Wood Products Association.
- 19 D. When nominal sizes are indicated, provide actual sizes required by PS 20 for moisture content
20 specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
- 21 **2.2 DIMENSIONAL LUMBER**
- 22 A. Beams, headers, joists, and rafters: Refer to the material specifications listed in the General Notes
23 of the Drawings.
- 24 B. Exposed framing indicated to be a natural finish or receive stain: Provide material free from
25 imperfections with uniformity of appearance. Refer to plans for material specification.
- 26 **2.3 ENGINEERED LUMBER**
- 27 A. Engineered lumber shall contain no urea formaldehyde.
- 28 B. Provide engineered lumber capable of supporting required loads and meeting or exceeding the
29 bending stress and modulus of elasticity as designated in the General Notes of the Drawings.
- 30 C. Available Manufacturers: Subject to compliance with design requirements. Manufacturers offering
31 products that may be incorporated into the work include, but are not limited to, the following:
- 32 **2.4 WOOD-PRESERVATIVE-TREATED MATERIALS**
- 33 A. Preservative Treatment by Pressure Process: AWWA T1 and AWWA U1.
- 34 1. Preservative Chemicals:
- 35 a. Alkaline Copper Quat (ACQ-C and ACQ-D)
36 b. Inorganic Boron (SBX)
37 c. Copper Azole (CBA-A and CA-B)
- 38 2. Wood treatment plant shall be experienced in performing work of this section, have
39 specialization in treatment of wood similar to that required for this project, and be licensed
40 by the manufacturer.

- 1 B. Kiln dry material after treatment to a maximum moisture content of 19 percent for lumber and 18
2 percent for plywood. Do not use material that is warped or does not comply with requirements for
3 untreated material.
- 4 C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do
5 not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- 6 D. All treated items shall bear an end tag or permanent ink stamp indicating the following:
- 7 1. Identification of treating manufacturer.
8 2. Type of preservative used.
9 3. Minimum preservative retention (pcf).
10 4. End use for which the product is treated.
11 5. Identity of the accredited inspection agency.
12 6. Standard to which the product is treated.
- 13 E. Application: Provide treated wood materials as indicated on the drawings.

14 **2.5 ROOF SHEATHING**

- 15 A. Plywood Roof Sheathing:
- 16 1. Exposure Durability: As indicated on plans.
17 2. Span rating: As indicated on plans.
18 3. Thickness: As indicated on plans.
19 4. Veneer Grade: As indicated on plans.
- 20 B. Oriented-Strand-Board Roof Sheathing:
- 21 1. Exposure Durability: As indicated on plans.
22 2. Span rating: As indicated on plans.
23 3. Thickness: As indicated on plans.

24 **2.6 MISCELLANEOUS LUMBER**

- 25 A. Grounds, Nailers, Rooftop Equipment Bases and Curbs, Blocking, Cants, Bucks and Shims:
26 Standard, stud, or No. 3 of mixed Southern Pine, Hem-Fir, Hem-Fir (North), or Spruce-Pine-Fir.
- 27 B. Wood preservative treatment for wood plates, curbs, cleats, nailing strips, cants, blocking, nailers
28 and similar items for roof deck construction shall be ACQ or other non-arsenate based preservative.
- 29 1. Oil based preservatives, such as creosote or pentachlorophenol types are not acceptable.
30 2. Paint surfaces, which are cut after treatment with a concentrated solution of the treatment.

31 **2.7 MISCELLANEOUS FASTENING REQUIREMENTS**

- 32 A. Furnish and install all fasteners and anchoring devices for entire project, which shall include items
33 as nails, screws, bolts, anchors, and similar items. Common nails shall be used for all fastening in
34 rough carpentry. Exterior exposed nails and screws shall be hot-dipped galvanized. Bolts shall have
35 standard threads and be complete with washers and nuts.
- 36 1. Lumber attached to structural steel shall be anchored direct with minimum 3/8 inch diameter
37 bolts spaced not greater than 48 inches on center.

- 1 2. Lumber attached to metal decking shall be anchored direct with two rows of 1/4 inch
2 diameter bolts or sheet metal lag screws spaced not greater than 24 inches on center for
3 each row.
- 4 3. Wood assemblies such as wood curbs, top nailers and other built-up members shall be
5 anchored with common nails or wood screws having at least 1-1/2 inch anchoring
6 penetration spaced in two staggered rows at 24 inches on center for each row.
- 7 4. Miscellaneous nailing shall be at Contractor's discretion for a secure and tight installation.
- 8 5. Pre-drill holes for all nails larger than 20d. Field drill bolt holes for proper matching and
9 bearing.
- 10 6. Lead holes for lag screws shall be installed as per NDS Section 9.1.2. Lag screws shall be
11 screwed and not driven into place.
- 12 7. Bolts shall be installed in holes bored with a bit 1/16 inch larger than the diameter of the
13 bolt. Bolts and nuts seating on wood shall have cut steel washers under heads and nuts.
14 Nuts shall be pulled tight and again checked and tightened just prior to enclosing bolted
15 members. Counterbore for bolted heads or nuts only where so indicated on the drawings,
16 and then only to sufficient depth to house the bolt or head or nut and washer. Cut off
17 excessive bolt projection where necessary. Nick threads to prevent loosening.

18 **2.8 FASTENERS**

- 19 A. General: Provide fasteners of size and type indicated that comply with requirements specified in this
20 Article for material and manufacture.
- 21 B. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity,
22 provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- 23 C. Nails, Brads, and Staples: ASTM F 1667.
- 24 D. Power-Driven Fasteners: CABO NER-272.
- 25 E. Wood Screws: ASME B18.6.1.
- 26 F. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and
27 reamer wings, length as recommended by screw manufacturer for material being fastened.
- 28 G. Lag Bolts: ASME B18.2.1.
- 29 H. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with
30 ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- 31 I. Metal Framing Anchors
- 32 1. General: Provide framing anchors made from metal indicated, of structural capacity, type,
33 and size indicated, and as follows:
- 34 a. Approved Manufacturers:
- 35 1) Simpson Strong-Tie
36 2) USP Structural Connectors
37 3) TECO
- 38 b. Research/Evaluation Reports: Provide products acceptable to authorities having
39 jurisdiction and for which model code research/evaluation reports exist that show
40 compliance of metal framing anchors, for application indicated, with building code
41 in effect for Project.

- 1 c. Allowable Design Loads: Provide products with allowable design loads, as
2 published by manufacturer, which meet or exceed those indicated. Manufacturer's
3 published values shall be determined from empirical data or by rational
4 engineering analysis and demonstrated by comprehensive testing performed by a
5 qualified independent testing agency.
- 6 2. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60
7 coating.

8 **PART 3 - EXECUTION**

9 **3.1 INSTALLATION, GENERAL**

- 10 A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit
11 rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers,
12 blocking, and similar supports to comply with requirements for attaching other construction.
- 13 B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small
14 to use with minimum number of joints or optimum joint arrangement.
- 15 C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and
16 plywood.
- 17 D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated,
18 complying with the following:
- 19 1. CABO NER-272 for power-driven fasteners.
- 20 2. Published requirements of metal framing anchor manufacturer.
- 21 3. Table 2304.9.1, "Fastening Schedule" in the IBC Code.
- 22 E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully
23 penetrate members where opposite side will be exposed to view or will receive finish materials. Make
24 tight connections between members. Install fasteners without splitting wood; predrill as required.
- 25 F. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill
26 holes with wood filler.
- 27 G. All installed wood roof nailers, cants, curbs, and similar items shall be protected from moisture until
28 covered with subsequent materials or flashing.

29 **3.2 WOOD BLOCKING, AND NAILER INSTALLATION**

- 30 A. Install where indicated and where required for attaching other work. Form to shapes indicated and
31 cut as required for true line and level of attached work. Coordinate locations with other work involved.
- 32 B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces,
33 unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work.
34 Where possible, secure anchor rods to formwork before concrete placement.
- 35 C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less
36 than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish
37 material. Remove temporary grounds when no longer required.

38 **3.3 WOOD FRAMING INSTALLATION, GENERAL**

- 39 A. Framing Standard: Comply with AF&PA's "Manual for Wood Frame Construction," unless otherwise
40 indicated.

- 1 B. Framing with Engineered Wood Products: Install engineered wood products to comply with
2 manufacturer's written instructions. The design provisions for solid sawn Douglas Fir lumber in the
3 Code are applicable to laminated veneer lumber.
- 4 C. Do not splice structural members between supports.
- 5 D. Maximum concentrated load on any joist to not exceed 100 pounds. Add joists when concentrated
6 load exceeds this value.
- 7 E. Provide a minimum of three inches of bearing for dimensional lumber. Refer to the supplier
8 requirements for bearing of laminated veneer lumber, unless noted otherwise.
- 9 F. Laminated veneer lumber beams shall be laterally supported at all points of bearing. Side mounted
10 joist hangers, nailing to shoulder studs, and nailing of sheathing to beam will satisfy this requirement.
- 11 G. Nails installed parallel to the glue lines on the narrow face shall not be spaced closer than four inches
12 for 10d common nails and three inches for 8d common nails.
- 13 H. Nails installed perpendicular to the glue lines on the wide face shall be installed in accordance with
14 the Building Code. Assemble laminated veneer lumber beams with a minimum of three 16d nails per
15 foot, fully penetrating each piece, unless noted otherwise.
- 16 I. Where built-up beams or girders of 2-inch nominal dimension lumber on edge are required, fasten
17 together with 2 rows of 20d nails spaced not less than 32 inches o.c, staggered on opposite faces.
18 Locate one row near top edge and other near bottom edge. Provide two (2) 20d nails at each end
19 and at each splice.
- 20 1. For continuous members, locate end joints over supports.

21 **END OF SECTION**

SECTION 06 16 00

SHEATHING

PART 1 – GENERAL

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
1. Wall sheathing.
 2. Sheathing joint and penetration treatment.

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-preserved treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
 3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
 4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

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.

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.

1 **PART 2 - PRODUCTS**

2 **2.1 PERFORMANCE REQUIREMENTS**

- 3 A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify
4 products with appropriate markings of applicable testing agency.
5 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or
6 from the listings of another qualified testing agency.

7 **2.2 WALL SHEATHING (SHTG-#)**

8 A. Glass-Mat Gypsum Sheathing (SHTG-1):

- 9 1. ASTM C 1177/1177M.
10 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
11 a. CertainTeed Corporation.
12 b. Georgia-Pacific Gypsum LLC.
13 c. National Gypsum Company.
14 d. Temple-Inland Building Products by Georgia-Pacific.
15 3. Type and Thickness: Type X, 5/8 inch thick.
16 4. Size: Largest size available for vertical installation.

17 B. Plywood Sheathing (SHTG-2):

- 18 1. Grade: DOC PS1, Exterior, FRT sheathing.
19 2. Span Rating: Not less than 32/16.
20 3. Nominal Thickness: Not less than 1/2 inch (13 mm).
21 4. Fire-Retardant-Treated Plywood:
22 a. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of
23 25 or less when tested according to ASTM E 84, and with no evidence of significant
24 progressive combustion when the test is extended an additional 20 minutes, and with the
25 flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at
26 any time during the test.
27 1) Use treatment that does not promote corrosion of metal fasteners.
28 2) Exterior Type: Treated materials shall comply with requirements specified above for
29 fire-retardant-treated plywood by pressure process after being subjected to
30 accelerated weathering according to ASTM D 2898. Use for exterior locations and
31 where indicated.
32 3) Design Value Adjustment Factors: Treated lumber plywood shall be tested according
33 to ASTM D 5516 and design value adjustment factors shall be calculated according to
34 ASTM D 6305. Span ratings after treatment shall be not less than span ratings
35 specified.
36 C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is
37 warped or does not comply with requirements for untreated material.
38 D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

39 **2.3 FASTENERS**

- 40 A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article
41 for material and manufacture.
42 1. For wall sheathing, provide fasteners of Type 304 stainless steel.
43 B. Nails, Brads, and Staples: ASTM F 1667.

44 **2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS**

- 45 A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834,
46 compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for
47 use with glass-fiber sheathing tape and for covering exposed fasteners.

48 **PART 3 - EXECUTION**

49 **3.1 INSTALLATION, GENERAL**

- 50 A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with
51 minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between
52 fewer than three support members.
53 B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction
54 unless otherwise indicated.

- 1 C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 2 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 - 3 2. ICC-ES evaluation report for fastener.
- 4 D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate
- 5 members where opposite side will be exposed to view or will receive finish materials. Make tight connections.
- 6 Install fasteners without splitting wood.
- 7 E. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are
- 8 installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- 9 F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support
- 10 elements.
- 11 G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not
- 12 exposed to precipitation or left exposed at end of the workday when rain is forecast.

13 3.2 GYPSUM SHEATHING INSTALLATION

- 14 A. Comply with GA-253 and with manufacturer's written instructions.
 - 15 1. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 16 2. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain
 - 17 moisture, to prevent wicking.
- 18 B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- 19 C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue
- 20 with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over
- 21 centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at
- 22 perimeter and within field of panel to each stud.
 - 23 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and
 - 24 ends of panels.
 - 25 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying
 - 26 self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is
 - 27 installed.
- 28 D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent
- 29 panels. Attach at perimeter and within field of panel to each stud.
 - 30 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and
 - 31 ends of panels.
 - 32 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying
 - 33 self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is
 - 34 installed.
- 35 E. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 36 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant
 - 37 to completely cover joints and fasteners after troweling. Seal other penetrations and openings.

38 3.3 WOOD STRUCTURAL PANEL INSTALLATION

- 39 A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction
- 40 Guide," for types of structural-use panels and applications indicated.
 - 41 1. Wall and Roof Sheathing:
 - 42 a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall
 - 43 sheathing panels.
 - 44 b. Screw to cold-formed metal framing.
 - 45 c. Space panels 1/8 inch (3 mm) apart at edges and ends.

46 END OF SECTION 06 16 00

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SECTION 06 18 00
GLUED-LAMINATED CONSTRUCTION

- 1
- 2
- 3 PART 1 – GENERAL
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- 5 1.2 RELATED WORK
- 6 1.3 REFERENCES
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24 **PART 1 - GENERAL**

25 **1.1 SECTION INCLUDES**

- 26 A. Design and construction using structural glued-laminated timber. Work shall include, but not be
- 27 limited to the following items:
 - 28 1. Framing members.
 - 29 2. Anchoring and fastening devices.
 - 30 3. Wood treatment.
- 31 B. Dimensional lumber items associated with glued-laminated timber framing is specified in Division 06.
- 32 C. Structural notes indicated on the drawings regarding glued-laminated construction shall be
- 33 considered a part of this specification.

34 **1.2 RELATED WORK**

- 35 A. Pertinent Sections of Division 01.
- 36 B. Section 06 10 00 - Rough Carpentry.
- 37 C. Section 06 13 00 - Heavy Timber Construction.
- 38 D. Section 06 15 00 - Wood Decking.

39 **1.3 REFERENCES**

- 40 A. Codes and Standards: Comply with the provisions of the following codes, specifications, and
- 41 standards, except where more stringent requirements are shown or specified. Where any provision
- 42 of other pertinent codes and standards conflict with this specification, the more stringent provision
- 43 shall govern.
 - 44 1. AITC 108 - Standard for Heavy Timber Construction.
 - 45 2. AITC 109 - Standard for Preservative Treatment of Structural Glued Laminated Timber.
 - 46 3. AITC 110 - Standard Appearance Grades for Structural Glued Laminated Timber.
 - 47 4. AITC 111 - Recommended Practice for Protection of Structural Glued Laminated Timber
 - 48 During Transit, Storage and Erection.

- 1 5. AITC 117 - Standard Specification for Structural Glued Laminated Timber of Softwood
- 2 Species.
- 3 6. AITC - Timber Construction Manual.
- 4 7. ANSI A190.1 - Standard for Wood Products - Structural Glued Laminated Timber.
- 5 8. ASTM A36 - Standard Specification for Carbon Structural Steel.
- 6 9. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and
- 7 Steel Products.
- 8 10. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- 9 11. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod
- 10 60,000 PSI Tensile Strength.
- 11 12. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
- 12 13. ASTM A575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
- 13 14. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron
- 14 Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- 15 15. ASTM A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon,
- 16 Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability,
- 17 and Ultra-High Strength.
- 18 16. ASTM D245 - Standard Practice for Establishing Structural Grades and Related Allowable
- 19 Properties for Visually Graded Lumber.
- 20 17. ASTM D3737 - Standard Practice for Establishing Allowable Properties for Structural Glued
- 21 Laminated Timber (Glulam).
- 22 18. ASTM D5664 - Standard Test Method for Evaluating the Effects of Fire-Retardant
- 23 Treatments and Elevated Temperatures on Strength Properties of Fire-Retardant Treated
- 24 Lumber.
- 25 19. ASTM D5933 - Standard Specification for 2 5/8-in. and 4-in. Diameter Metal Shear Plates
- 26 for Use in Wood Construction.
- 27 20. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building
- 28 Materials.
- 29 21. AWPA M4 - Standard for the Care of Preservative-Treated Wood Products.
- 30 22. AWPA P5 - Standard for Waterborne Preservatives.
- 31 23. AWPA P17 - Fire-Retardant Formulations.
- 32 24. AWPA T1 - Use Category System: Processing and Treatment Standard.
- 33 25. AWPA U1 -Use Category System: User Specification for Treated Wood.
- 34 26. NDS - National Design Specification for Wood Construction with Commentary.
- 35 27. NDS Supplement - National Design Specification Values for Wood Construction.
- 36 28. NIST PS 20 - Voluntary Product Standard - American Softwood Lumber Standard.

37 **1.4 QUALITY ASSURANCE**

- 38 A. Manufacturer Qualifications:
- 39 1. The glued-laminated timber manufacturer shall be an AITC or APA-EWS licensed firm
 - 40 complying with AITC A190.1.
 - 41 2. Shall have not less than five (5) years of continuous experience in manufacturing glued-
 - 42 laminated structural units.
 - 43 3. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or
 - 44 APA-EWS trademark. Place mark on surfaces that will not be exposed in the final installed
 - 45 condition.
- 46 B. Design Qualifications:
- 47 1. Delegated Design: Design structural glued-laminated timber and connectors, including
 - 48 comprehensive engineering analysis by a qualified Professional Engineer, using
 - 49 performance requirements and design criteria indicated.
 - 50 2. Structural Performance: Structural glued-laminated timber and connectors shall withstand
 - 51 the effects of structural loads without exceeding allowable design working stresses listed in
 - 52 AITC 117 or determined according to ASTM D3737 and acceptable to Authorities Having
 - 53 Jurisdiction.

1 **1.5 SYSTEM PERFORMANCE REQUIREMENTS**

- 2 A. Structural Performance: Provide structural glued-laminated timber, including connectors, capable of
3 withstanding structural loads shown on drawings without exceeding allowable design working
4 stresses listed.
- 5 1. Framing: Provide structural glued-laminated timber, including connectors, capable of
6 withstanding the design loads.
- 7 2. Design Loads: As indicated on the drawings.
- 8 3. Maximum Deflection under Design Loads:
- 9 a. Floor: L/360.
- 10 B. Employ a licensed Professional Engineer, registered in the state where the project is located, to
11 perform design. Sign and seal shop drawings and design calculations submitted to
12 Architect/Engineer for review. Prepare and seal drawings and calculations for submittal to authorities
13 having jurisdiction. Comply with design intent, criteria, and requirements of the drawings.

14 **1.6 SUBMITTALS**

- 15 A. Product Data: For each type of product indicated.
- 16 1. Include data on lumber, adhesives, fabrication and protection.
- 17 2. Include connector installation instructions.
- 18 3. Wood treatment data as follows, including chemical treatment manufacturer's warranty and
19 instructions for handling, storing, installing, and finishing treated materials:
- 20 a. For each type of preservative-treated wood product, include certification by treating
21 plant stating type of preservative solution and pressure process used, net amount
22 of preservative retained, and compliance with applicable standard.
- 23 b. For waterborne-treated products, include statement that moisture content of
24 treated materials was reduced to levels indicated before shipment to the project
25 site.
- 26 B. Shop drawings:
- 27 1. Show layout of structural glued-laminated timber system and full dimensions of each
28 member.
- 29 a. Indicate species and laminating combination, adhesive type and other variables in
30 required work.
- 31 b. Include large scale details of connections.
- 32 c. Structural analysis calculations.
- 33 C. Samples: Provide full width and depth, 24 inches long, showing the range of variation to be expected
34 in appearance of structural glued-laminated timber, including variations due to specified treatment.
35 Apply specified factory finish to three sides of half-length of each sample.
- 36 D. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that
37 structural glued-laminated timber complies with requirements in AITC A190.1.
- 38 E. Material Certificates: For preservative-treated wood products, from manufacturer. Indicate type of
39 preservatives used and net amount of preservative retained.

1 **1.7 DELIVERY, STORAGE, AND HANDLING**

2 A. Comply with provisions of AITC 111.

3 B. All members shall be delivered, piled, and handled so as to protect them from warping due to
4 excessive moisture or damage. Members shall be stored off the ground and individually wrapped
5 using a plastic-coated paper covering with water-resistant seams.

6 C. All installed exposed members shall be protected from moisture until covered with subsequent
7 roofing materials or flashings.

8 **PART 2 - PRODUCTS**

9 **2.1 MANUFACTURERS**

10 A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
11 manufacturers offering products that may be incorporated into the work, but are not limited to, the
12 following:

- 13 1. American Laminators, Oregon.
- 14 2. Boise Cascade, LLC, Idaho.
- 15 3. Calvert Co., Inc., Washington.
- 16 4. Laminated Timbers, Inc., Kentucky.
- 17 5. Sentinel Structures, Inc., Wisconsin.
- 18 6. Timber Technologies, Wisconsin.

19 **2.2 STRUCTURAL GLUED-LAMINATED TIMBER**

20 A. General: Provide structural glued-laminated timber that complies with AITC A190.1 and AITC 117 or
21 research / evaluation reports acceptable to authorities having jurisdiction.

22 1. Provide structural glued-laminated timber made from single species.

23 2. Provide structural glued-laminated timber made from solid lumber laminations; do not use
24 laminated veneer lumber.

25 3. Provide structural glued-laminated timber made with wet-use adhesive complying with
26 AITC A190.1.

27 4. Adhesive shall not contain urea-formaldehyde resins.

28 B. Species and Grades for Structural Glued-Laminated Timber: Provide grades needed to comply with
29 "System Performance Requirements" Article section 1.6.

30 1. Douglas fir-larch

31 C. Species and Grades for Structural Glued-Laminated Timber: Provide grades needed to comply with
32 structural properties, combination symbols and beam stress classifications indicated on drawings.

33 D. Appearance Grade: Architectural, complying with AITC 110.

34 1. For Architectural appearance grades, fill voids as required by AITC 110.

35 E. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding
36 the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

37 F. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible
38 with indicated finish.

- 1 G. Preservative Treatment: Glued-laminated timber shall comply with AWPA U1.
- 2 1. Use preservative solution without substances that may interfere with application of indicated
3 finishes.
- 4 2. Do not incise structural glued-laminated timber or wood used to produce structural glued-
5 laminated timber.

6 **2.3 TIMBER CONNECTORS**

- 7 A. Provide connectors as detailed on drawings. Basis of design for metal framing anchor products is
8 Simpson Strong-Tie Co. Inc.
- 9 B. drawings indicate schematic connectors. Engage a licensed **Professional** Engineer to design
10 structural glued-laminated connectors.
- 11 C. Materials: Refer to drawings for connection material.
- 12 D. Bolts: Provide 3/4-inch diameter bolts complying with ASTM A307, Grade A; nuts complying with
13 ASTM A563; and, where indicated, flat washers.
- 14 E. Finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil dry film thickness.
- 15 F. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A123 or
16 ASTM A153.
- 17 G. Unless noted otherwise, all timber connections are to be concealed with all holes plugged.

18 **2.4 FABRICATION**

- 19 A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt
20 holes.
- 21 1. Dress exposed surfaces as needed to remove planing and surfacing marks.
- 22 B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or
23 parabolic camber equal to 1/500 of span.
- 24 C. Where preservative-treated members are indicated, fabricate (cut, drill, surface, and sand) before
25 treatment to greatest extent possible. Where fabrication must be done after treatment, apply a field-
26 treatment preservative to comply with AWPA M4.
- 27 1. Use inorganic boron (SBX) treatment for members not in contact with the ground and
28 continuously protected from liquid water.
- 29 2. Use copper naphthenate treatment for members in contact with the ground or not
30 continuously protected from liquid water.
- 31 D. End-Cut Sealing: Immediately after end cutting each member to final length and, after preservative
32 treatment, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping
33 surfaces flood coated for not less than 10 minutes.
- 34 E. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of
35 penetrating sealer on surfaces of each unit, except for preservative-treated wood where treatment
36 included a water repellent.

1 **2.5 FACTORY FINISH**

- 2 A. Wiped Stain Finish: Manufacturer's standard, dry-appearance, penetrating acrylic stain and sealer;
3 oven dried and resistant to mildew and fungus.
- 4 1. Color:
- 5 a. As selected by Architect/Engineer from manufacturer's full range
- 6 B. Clear Finish: Manufacturer's standard, two-coat, clear varnish finish; resistant to mildew and fungus.

7 **2.6 MISCELLANEOUS MATERIAL**

- 8 A. Galvanizing Repair Paint: SSPC-Paint 20 with dry film containing a minimum of 94 percent zinc dust
9 by weight.

10 **PART 3 - EXECUTION**

11 **3.1 EXAMINATION**

- 12 A. Examine substrates in areas to receive structural glued-laminated timber, with installer present, for
13 compliance with requirements, installation tolerances, and other conditions affecting performance of
14 the work.
- 15 B. Proceed with installation only after unsatisfactory conditions have been corrected.
- 16 C. Beginning of installation means acceptance of existing conditions.

17 **3.2 INSTALLATION**

- 18 A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints.
19 Provide temporary bracing to maintain lines and levels until permanent supporting members are in
20 place.
- 21 1. Install structural glued-laminated timber to comply with the shop drawings.
- 22 2. Handle and temporarily support glued-laminated timber to prevent surface damage,
23 compression, and other effects that might interfere with indicated finish.
- 24 3. Lift with padded slings and protect corners with wood blocking.
- 25 B. Framing Built into Masonry: Provide 1/2-inch clearance at tops, sides, and ends of members built
26 into masonry; bevel cut ends 3 inches; and do not embed more than 4 inches unless otherwise
27 indicated.
- 28 C. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with
29 requirements for shop fabrication.
- 30 D. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified
31 surfacing and finishing.
- 32 1. Predrill for fasteners using timber connectors as templates.
- 33 2. Finish exposed surfaces to remove planing or surfacing marks and to provide a finish
34 equivalent to that produced by machine sanding with No. 120 grit sandpaper.
- 35 3. Coat cross cuts with end sealer.

- 1
2 4. Where preservative-treated members must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.
- 3 a. Use inorganic boron (SBX) treatment for members not in contact with the ground
4 and continuously protected from liquid water.
- 5 b. Use copper naphthenate treatment for members in contact with the ground or not
6 continuously protected from liquid water.
- 7 E. Install timber connectors as indicated.
- 8 1. Unless otherwise indicated, install bolts with same orientation within each connection and
9 in similar connections.
- 10 2. Install bolts with orientation as indicated or, if not indicated, as directed by
11 Architect/Engineer.
- 12 F. Where beams penetrate through exterior walls, apply waterproof sealer as recommended by the
13 manufacturer.
- 14 **3.3 ADJUSTING**
- 15 A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glued-
16 laminated timber if repairs are not approved by Architect/Engineer.
- 17 **3.4 TOLERANCES**
- 18 A. Framing Members: 1/2 inch maximum from true position.
- 19 **3.5 PROTECTION**
- 20 A. Do not remove wrappings on individually wrapped members until they no longer serve a useful
21 purpose, including protection from weather, sunlight, soiling, and damage from work of other trades.
- 22 1. Coordinate wrapping removal with finishing work. Retain wrapping where it can serve as a
23 painting shield.
- 24 B. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.
- 25 **END OF SECTION**

SECTION 06 20 13

EXTERIOR FINISH CARPENTRY

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PART 2 – PRODUCTS

- 2.1 [MATERIALS, GENERAL \(WD-1\)](#)
- 2.2 [WOOD-PRESERVATIVE-TREATED LUMBER - SLEEPERS](#)
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PART 3 – EXECUTION

- 3.1 [EXAMINATION](#)
- 3.2 [INSTALLATION, GENERAL](#)
- 3.3 [ADJUSTING](#)
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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Brise-soleil at glue-laminated roof truss "tails".
 - 2. Underside of the outdoor classroom roof framing.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.

1.3 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.
 - 1. Include copies of warranties from chemical-treatment manufacturers for each type of treatment.
- B. LEED Submittals:
 - 1. Certificates for Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
- C. Samples for Verification:
 - 1. For each species and cut of lumber and panel products, with 1/2 of exposed surface finished; 50 sq. in. for lumber.
- D. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a mockup submittal for review.
 - 1. Mock-up: BRISE-SOLEIL: Two bays or one structural grid width, with steel support, fins and end fascia.

1.4 INFORMATIONAL SUBMITTALS

- A. Compliance Certificates:
 - 1. For lumber that is not marked with grade stamp.

- 1 **1.5 DELIVERY, STORAGE, AND HANDLING**
2 A. Stack lumber flat with spacers between each bundle to provide air circulation. Protect materials from
3 weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks
4 and under coverings.
- 5 **1.6 FIELD CONDITIONS**
6 A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit
7 work to be performed and at least one coat of specified finish can be applied without exposure to rain,
8 snow, or dampness.
9 B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
10 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration,
11 sagging, or irregular shape.
12 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy
13 surface contamination and discoloration.
- 14 **1.7 WARRANTY**
15 A. Manufacturer's Warranty: Manufacturer agrees to repair or replace lumber that fail in materials or
16 workmanship within specified warranty period.

17 **PART 2 - PRODUCTS**

- 18 **2.1 MATERIALS, GENERAL**
19 A. Certified Wood: The following wood products shall be produced from wood obtained from forests certified
20 by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for
21 Forest Stewardship":
22 1. Exterior trim.
23 B. Lumber (**WD-1**):
24 1. Acetylated Wood:
25 a. Accsys Technologies PLC: Accoya Wood - Radiata Pine.
26 C. Concealed lumber – Sleepers.
27 1.
28 D. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species,
29 moisture content at time of surfacing, and mill.
30 1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and
31 provide certificates of grade compliance issued by inspection agency.
- 32 **2.2 WOOD-PRESERVATIVE-TREATED LUMBER - SLEEPERS**
33 A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b for exterior construction not
34 in contact with ground.
35 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or
36 chromium.
37 B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is
38 warped or that does not comply with requirements for untreated material.
39 C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
40 D. Application: Treat items indicated on Drawings, and the following:
41 1. Wood sleepers.
- 42 **2.3 METAL FRAMING ANCHORS**
43 A. Allowable design loads, as published by manufacturer, shall meet or exceed those of basis-of-design
44 products. Manufacturer's published values shall be determined from empirical data or by rational
45 engineering analysis and demonstrated by comprehensive testing performed by a qualified independent
46 testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as
47 framing anchors.
48 B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60
49 (Z180) coating designation.
50 C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-
51 alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550)
52 coating designation; and not less than 0.036 inch (0.9 mm) thick.
53 1. Use for wood-preservative-treated lumber and where indicated.

- 1 **2.4 MISCELLANEOUS MATERIALS**
2 A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less
3 than 1-1/2 inches into wood substrate.
4 1. For prefinished items, provide matching prefinished aluminum fasteners where face fastening is
5 required.
6 2. For applications not otherwise indicated, provide hot-dip galvanized-steel fasteners.

7 **PART 3 - EXECUTION**

- 8 **3.1 EXAMINATION**
9 A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and
10 other conditions affecting performance.
11 B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged,
12 and mold damaged.
13 C. Proceed with installation only after unsatisfactory conditions have been corrected.

- 14 **3.2 INSTALLATION, GENERAL**
15 A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or
16 too small to fabricate with proper jointing arrangements.
17 1. Do not use lumber with defective surfaces, sizes, or mill marks.
18 B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials.

- 19 **3.3 ADJUSTING**
20 A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish
21 carpentry may be repaired or refinished if work complies with requirements and shows no evidence of
22 repair or refinishing. Adjust joinery for uniform appearance.

- 23 **3.4 CLEANING**
24 A. Clean exterior finish carpentry on exposed and semi exposed surfaces.

- 25 **3.5 PROTECTION**
26 A. Protect installed products from damage from weather and other causes during construction.
27 B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
28 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration,
29 sagging, or irregular shape.
30 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy
31 surface contamination and discoloration.

32 **END OF SECTION 06 20 13**

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SECTION 06 40 23
INTERIOR FINISH CARPENTRY

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- 21 PART 3 – EXECUTION
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- 26 [3.5 SHELVING INSTALLATION](#)
- 27 [3.6 ADJUSTING AND CLEANING](#)

28 **PART 1 - GENERAL**

29 **1.1 RELATED DOCUMENTS**

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

32 **1.2 SUMMARY**

- 33 A. Section Includes:
 - 34 1. Interior trim.
 - 35 2. Shelving.
 - 36 3. Window stools.
 - 37 4. Reclaimed wood (WD-2)
 - 38 5. Related woodwork accessories.
- 39 B. Related Requirements:
 - 40 1. Division 06 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required
 - 41 for installing woodwork and concealed within other construction before woodwork installation.

42 **1.3 PREINSTALLATION MEETINGS**

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

44 **1.4 DEFINITIONS**

- 45 A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing
- 46 woodwork items unless concealed within other construction before woodwork installation.

47 **1.5 ACTION SUBMITTALS**

- 48 A. Product Data: For each type of process and factory-fabricated product.
- 49 B. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating
- 50 plant that treated materials comply with requirements.
- 51 C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details,
- 52 attachment devices, and other components.
 - 53 1. Show details full size.

- 1 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and
- 2 reinforcement specified in other Sections.
- 3 3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and
- 4 other items installed in architectural woodwork.
- 5 4. Coordination of adjoining construction, trim and moldings.
- 6 D. Sustainable Design Submittals:
- 7 1. Product Certificates: For regional materials, indicating location of material manufacturer and point of
- 8 extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each
- 9 regional material.
- 10 2. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
- 11 3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
- 12 4. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
- 13 5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for
- 14 low-emitting materials.
- 15 6. Product Data: For installation adhesives, indicating VOC content.
- 16 7. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-
- 17 emitting materials.
- 18 E. Samples: For each type of trim, board, stool and panel.
- 19 F. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

20 **1.6 QUALITY ASSURANCE**

- 21 A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-
- 22 accredited certification body.
- 23 B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- 24 C. Installer Qualifications: Certified participant in AWI's Quality Certification Program.
- 25 D. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production
- 26 of interior architectural woodwork with sequence-matched wood veneers.
- 27 1. Fabricator Qualifications: Certified participant in AWI's Quality Certification Program with not less
- 28 than 10 years experience in projects of similar size.
- 29 E. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality
- 30 Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and
- 31 other requirements.
- 32 1. Provide AWI Quality Certification Program labels or certificates indicating that woodwork, including
- 33 installation, complies with requirements of grades specified.
- 34 F. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide
- 35 materials and products with specified fire-test-response characteristics as determined by testing identical
- 36 products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to
- 37 authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency
- 38 in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces
- 39 of materials that will be concealed from view after installation.
- 40 G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic
- 41 effects and set quality standards for materials and execution.
- 42 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by the Architect.
- 43 2. Notify Architect seven (7) days in advance of dates and times when mockups will be fabricated and
- 44 installed.
- 45 3. Demonstrate the proposed range of aesthetic effects and workmanship.
- 46 4. Obtain Architect's approval of mockups before starting interior architectural woodwork fabrication.
- 47 5. Maintain approved mockups throughout construction in an undisturbed condition as the standard for
- 48 judging completed work.
- 49 6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial
- 50 Completion.
- 51 H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01
- 52 Section "Project Management and Coordination."

53 **1.7 DELIVERY, STORAGE, AND HANDLING**

- 54 A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and
- 55 deterioration.
- 56 B. Do not deliver woodwork until painting and similar operations that could damage woodwork have been
- 57 completed in installation areas. If woodwork must be stored in other than installation areas, store only in
- 58 areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

- 1 **1.8 FIELD CONDITIONS**
2 A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is
3 complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and
4 relative humidity between 25 and 55 percent during the remainder of the construction period.
5 B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other
6 construction by field measurements before fabrication, and indicate measurements on Shop Drawings.
7 Coordinate fabrication schedule with construction progress to avoid delaying the Work.
8 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field
9 measurements before being enclosed, and indicate measurements on Shop Drawings.
10 2. Established Dimensions: Where field measurements cannot be made without delaying the Work,
11 establish dimensions and proceed with fabricating woodwork without field measurements. Provide
12 allowance for trimming at site, and coordinate construction to ensure that actual dimensions
13 correspond to established dimensions.

- 14 **1.9 COORDINATION**
15 A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work
16 specified in other Sections to ensure that interior architectural woodwork can be supported and installed as
17 indicated.
18 B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 08 Section
19 "Door Hardware " to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with
20 hardware requirements.

21 **PART 2 - PRODUCTS**

22 **2.1 INTERIOR ARCHITECTURAL WOODWORK FABRICATORS**

- 23 A. Fabricators: Subject to compliance with requirements.

24 **2.2 INTERIOR ARCHITECTURAL WOODWORK, GENERAL**

- 25 A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for
26 grades of interior architectural woodwork indicated for construction, finishes, installation, and other
27 requirements.
28 1. Provide inspections of fabrication and installation together with labels and certificates from AWI
29 certification program indicating that woodwork complies with requirements of grades specified.
30 2. The Contract Documents contain requirements that are more stringent than the referenced quality
31 standard. Comply with requirements of Contract Documents in addition to those of the referenced
32 quality standard.

33 **2.3 MATERIALS, GENERAL**

- 34 A. Regional Materials: The following wood products shall be manufactured within 500 miles (800 km) of Project
35 site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500
36 miles (800 km) of Project site.
37 1. Interior trim.
38 2. Interior board paneling.
39 3. Shelving and clothes rods.
40 B. Certified Wood: The following wood products shall be certified as "FSC Pure" according to FSC STD-01-00
41 and FSC STD-40-004.
42 1. Interior trim.
43 2. Interior board paneling.
44 3. Shelving and clothes rods.
45 C. Composite Wood Products: Products shall be made without urea formaldehyde.
46 D. Wood Species and Cut for Transparent Finish: Provide AWI Premium grade wood of similar grain, texture,
47 and density to produce uniformity of color and finish throughout the complete installation of furniture,
48 architectural woodwork, and millwork as follows:
49 E. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both
50 faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of
51 NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
52 1. Color: As selected by Architect from manufacturer's full range.

- 1 **2.4 FIRE-RETARDANT-TREATED MATERIALS**
2 A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of
3 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion
4 when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5
5 feet beyond the centerline of the burners at any time during the test.
6 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent
7 respectively.
8 B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency
9 acceptable to authorities having jurisdiction.
10 1. For exposed lumber and plywood indicated to receive a stained or natural finish, mark back of each
11 piece.
12 C. Application: All interior lumber and plywood.

- 13 **2.5 SHELVING AND CLOTHES RODS**
14 A. Shelving: Made from one of the following materials, 3/4 inch thick.
15 1. Particleboard with solid-wood front edge.
16 2. MDF with solid-wood front edge.
17 3. MDO softwood plywood with solid-wood edge.
18 4. Melamine-faced particleboard with radiused and filled front edge.
19 5. Softwood Boards: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine; C Select
20 (Choice); NeLMA, NLGA, or WWPA; kiln dried.
21 6. Softwood Boards: Douglas fir-larch, Douglas fir south, or hem-fir; Superior or C & Btr finish; NLGA,
22 WCLIB, or WWPA; or southern pine, B & B finish; SPIB; kiln dried.
23 B. Shelf Cleats: 3/4-by-3-1/2-inch boards, as specified above for shelving.
24 C. Shelf Brackets with Rod Support: BHMA A156.16, B04051; prime-painted formed steel.
25 D. Shelf Brackets without Rod Support: BHMA A156.16, B04041; prime-painted formed steel.
26 E. Closet Rods: 1-5/16-inch-diameter, chrome-plated-steel tubes complying with BHMA A156.16, L03131..

- 27 **2.6 RECLAIMED WOOD (WD-2)**
28 A. Reclaimed Ash:
29 1. Source: Refer to Drawings
30 2. Description: Refer to Drawings

- 31 **2.7 MISCELLANEOUS MATERIALS**
32 A. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general
33 carpentry use.
34 1. Adhesives shall have a VOC content of 30 g/L or less.
35 2. Adhesive shall comply with the testing and product requirements of the California Department of
36 Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical
37 Emissions from Indoor Sources Using Environmental Chambers."
38 B. Paneling Adhesive: Comply with paneling manufacturer's written recommendations for adhesives.
39 1. Adhesives shall have a VOC content of 50 g/L or less.
40 2. Adhesive shall comply with the testing and product requirements of the California Department of
41 Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical
42 Emissions from Indoor Sources Using Environmental Chambers."

43 **PART 3 - EXECUTION**

- 44 **3.1 PREPARATION**
45 A. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation
46 areas for a minimum of 24 hours **unless longer conditioning is recommended by manufacturer.**
47

- 1 **3.2 INSTALLATION, GENERAL**
2 A. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims
3 where necessary for alignment.
4 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended
5 by manufacturer.
6 2. Countersink fasteners, fill surface flush, and sand unless otherwise indicated.
7 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish
8 carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for
9 reveal installation.
10 4. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no
11 more than 3/8-inch variation between largest and smallest treads and risers within each flight.

- 12 **3.3 STANDING AND RUNNING TRIM INSTALLATION**
13 A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber
14 available. Cope at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints
15 with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints.

- 16 **3.4 PANELING INSTALLATION**
17 A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain
18 character and color between adjacent panels. Leave 1/4-inch gap to be covered with trim at top, bottom,
19 and openings. Install with uniform tight joints between panels.
20 1. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners. Space
21 fasteners and adhesive as recommended by panel manufacturer.
22 2. Conceal fasteners to greatest practical extent.
23 B. Hardboard Paneling: Install according to manufacturer's written recommendations. Leave 1/4-inch gap to be
24 covered with trim at top, bottom, and openings. Butt adjacent panels with moderate contact. Use fasteners
25 with prefinished heads matching paneling color.
26 C. Board Paneling: Arrange in random-width pattern suggested by manufacturer unless boards or planks are
27 of uniform width.
28 1. Install in full lengths without end joints.
29 2. Stagger end joints in random pattern to uniformly distribute joints on each wall.
30 3. Select and arrange boards on each wall to minimize noticeable variations in grain character and color
31 between adjacent boards. Install with uniform tight joints between boards.
32 4. Fasten paneling by face nailing, setting nails, and filling over nail heads.
33 5. Fasten paneling with trim screws, set below face and filled.
34 6. Fasten paneling by blind nailing through tongues.

- 35 **3.5 SHELVING INSTALLATION**
36 A. Cut shelf cleats at ends of shelves about 1/2 inch less than width of shelves and sand exposed ends smooth.
37 B. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and
38 filled. Space fasteners not more than 16 inches o.c.
39 C. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches o.c.
40 Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
41 D. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled.
42 Install shelves, fully seated on cleats, brackets, and supports.

- 43 **3.6 ADJUSTING AND CLEANING**
44 A. Repair damaged and defective interior architectural woodwork, where possible, to eliminate functional and
45 visual defects. Where not possible to repair, replace interior architectural woodwork. Adjust joinery for
46 uniform appearance.
47 B. Clean interior architectural woodwork on exposed and semiexposed surfaces. Touch up shop-applied
48 finishes to restore damaged or soiled areas.

49 **END OF SECTION**

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SECTION 06 41 16
ARCHITECTURAL CABINETS

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- 21 [3.1 PREPARATION](#)
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23 **PART 1 - GENERAL**

24 **1.1 RELATED DOCUMENTS**

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

27 **1.2 SUMMARY**

- 28 A. Section Includes:
 - 29 1. Plastic-laminate-faced architectural cabinets.
 - 30 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural
 - 31 cabinets unless concealed within other construction before cabinet installation.
- 32 B. Related Requirements:
 - 33 1. Section 12 36 23.13 "Plastic-Laminate-Clad Countertops."

34 **1.3 COORDINATION**

- 35 A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of
- 36 Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

37 **1.4 PREINSTALLATION MEETINGS**

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

39 **1.5 ACTION SUBMITTALS**

- 40 A. Product Data: For each type of product, including panel products high-pressure decorative laminate
- 41 adhesive for bonding plastic laminate fire-retardant-treated materials and cabinet hardware and
- 42 accessories.
- 43 B. Sustainable Design Submittals:
 - 44 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content
 - 45 and cost.
 - 46 2. Product Certificates: For regional materials, indicating location of material manufacturer and point
 - 47 of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for
 - 48 each regional material.
 - 49 3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 50 4. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
 - 51 5. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting
 - 52 materials.

- 1 6. Product Data: For composite wood products, indicating that product contains no urea
- 2 formaldehyde.
- 3 7. Laboratory Test Reports: For composite wood products, indicating compliance with requirements
- 4 for low-emitting materials.
- 5 C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details,
- 6 attachment devices, and other components.
- 7 D. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a
- 8 mockup submittal for review.
- 9 1. Mockup: Typical millwork unit at classroom east wall with drawers, door in front of drawers, and
- 10 adjustable shelf cabinet with door.
- 11 E. Samples:
- 12 1. Plastic laminates, for each color, pattern, and surface finish.
- 13 2. Thermoset decorative panels, for each color, pattern, and surface finish.

14 **1.6 INFORMATIONAL SUBMITTALS**

- 15 A. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

16 **1.7 QUALITY ASSURANCE**

- 17 A. Fabricator Qualifications: Certified participant in AWI's Quality Certification Program.
- 18 B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

19 **1.8 DELIVERY, STORAGE, AND HANDLING**

- 20 A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets
- 21 have been completed in installation areas. Store cabinets in installation areas or in areas where
- 22 environmental conditions comply with requirements specified in "Field Conditions" Article.

23 **1.9 FIELD CONDITIONS**

- 24 A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is
- 25 complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy
- 26 levels during the remainder of the construction period.

27 **PART 2 - PRODUCTS**

28 **2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS**

- 29 A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for
- 30 grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other
- 31 requirements.
- 32 1. Provide labels and certificates from AWI certification program indicating that woodwork, including
- 33 installation, complies with requirements of grades specified.
- 34 B. Grade: Premium.
- 35 C. Regional Materials: Wood products shall be manufactured within 500 miles (800 km) of Project site from
- 36 materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles
- 37 (800 km) of Project site.
- 38 D. Regional Materials: Wood products shall be manufactured within 500 miles (800 km) of Project site.
- 39 E. Certified Wood: Wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to
- 40 FSC STD-01-001 and FSC STD-40-004.
- 41 F. Type of Construction: Frameless.
- 42 G. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- 43 H. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by
- 44 woodwork quality standard.
- 45 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 46 a. Formica Corporation.
- 47 b. Pionite: a Panolam Industries International, Inc. brand.
- 48 c. Wilsonart International Holdings, Inc.
- 49 I. Laminate Cladding for Exposed Surfaces: **(PLAM-#)**
- 50 1. Refer to Material Tag Index.
- 51 2. Horizontal Surfaces: Grade HGS.
- 52 3. Postformed Surfaces: Grade HGP.
- 53 4. Vertical Surfaces: Grade HGS.
- 54 5. Pattern Direction: As indicated.
- 55

- 1 J. Materials for Semiexposed Surfaces:
- 2 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3,
- 3 Grade VGS.
- 4 2. Drawer Sides and Backs: Solid-hardwood lumber.
- 5 3. Drawer Bottoms: Hardwood plywood.
- 6 K. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located
- 7 directly under tops.
- 8 L. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of
- 9 exposed laminate surfaces complying with the selected material:

10 2.2 WOOD MATERIALS

- 11 A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each
- 12 type of woodwork and quality grade specified unless otherwise indicated.
- 13 1. Wood Moisture Content: 5 to 10 percent.
- 14 B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced
- 15 quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
- 16 C. Composite Wood Products: Products shall be made without urea formaldehyde.
- 17 1. Softwood Plywood: DOC PS 1, medium-density overlay.
- 18 2. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

19 2.3 FIRE-RETARDANT-TREATED MATERIALS

- 20 A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use
- 21 materials complying with requirements in this article that are acceptable to authorities having jurisdiction
- 22 and with fire-test-response characteristics specified as determined by testing identical products per test
- 23 method indicated by a qualified testing agency.
- 24 1. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing
- 25 agency in the form of removable paper label or imprint on surfaces that will be concealed from view
- 26 after installation.
- 27 B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when
- 28 tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is
- 29 extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the
- 30 centerline of the burners at any time during the test.
- 31 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent,
- 32 respectively.

33 2.4 CABINET HARDWARE AND ACCESSORIES (MA-#)

- 34 A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except
- 35 for items specified in Division 08 Section "Door Hardware."
- 36 B. Refer to Drawings Material ID List for cabinet hardware accessories.
- 37 C. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for
- 38 BHMA finish numbers indicated:
- 39 1. Satin Chrome: BHMA 626 /652.
- 40 2. Satin Stainless Steel: BHMA 630.
- 41 3. For concealed hardware, provide manufacturer's standard finish that complies with product class
- 42 requirements in BHMA A156.9.
- 43 D. For concealed hardware, provide manufacturer's standard finish that complies with product class
- 44 requirements in BHMA A156.9.
- 45 E. Frameless Concealed Hinges (European Type): Totally concealed spring-activated, self-closing European
- 46 type cabinet hinges for vertical, horizontal, and depth adjustment, not less than 165 degrees opening,
- 47 except provide 90 degree opening where door may strike adjacent walls or cabinets. Nickel plated.
- 48 1. Acceptable manufacturers and products:
- 49 a. Hafele America, Co; Duomatic #0.329.06.
- 50 b. Grass America, Inc.; #3903.
- 51 c. Hettich America; Euromat Topsafe #4955.
- 52 F. Center Pivot Hinges: Totally concealed spring-activated, self-closing European type cabinet hinges for
- 53 Trash / Recycling Containers. Nickel plated.
- 54 1. Acceptable manufacturers and products:
- 55 a. E.R. Butler & Co Manufacturing.
- 56 G. Adjustable Shelf Standards and Supports:
- 57 H. Drawer Slides: BHMA A156.9, B05091.
- 58 1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated
- 59 steel ball-bearing slides.

- 1 2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
- 2 3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
- 3 4. Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches high and 24 inches wide.
- 4 5. Keyboard Slides: Grade 1HD-100; for computer keyboard shelves.
- 5 6. Trash Bin Slides: Grade 1HD-200; for trash bins not more than 20 inches high and 16 inches wide.
- 6 I. Door Locks: BHMA A156.11, E07121.
- 7 J. Drawer Locks: BHMA A156.11, E07041.
- 8 K. Plastic Grommets for Cable Passage through Countertops: 3-inch OD, black, molded-plastic grommets
9 and matching plastic caps with slot for wire passage.
 - 10 1. Product: Subject to compliance with requirements, provide "XG series" by Doug Mockett &
11 Company, Inc.
 - 12 2. Finish: Polished Stainless Steel.
- 13 L. Wardrobe Specialties:
 - 14 1. Clothes Rods: Knapé & Vogt Mfg.; #660 Stainless Steel tubing; regular finish; 1-1/16 inch OD with
15 wall thickness of not less than 0.087 inch.
 - 16 a. Provide lengths required for single piece installation.
 - 17 2. Mounting Brackets: Knapé & Vogt Mfg.; #734CHR and #735CHR flanges.
 - 18 3. Fasteners: Stainless Steel as required.
- 19 M. Moldings and Trim:
 - 20 1. 'J' Molding
 - 21 a. Manufacturer: Fry Reglet
 - 22 b. Product Number: JDM-50-50
 - 23 c. Finish: Clear Anodized Aluminum.
 - 24 2. X' Molding
 - 25 a. Manufacturer: Fry Reglet
 - 26 b. Product Number: XDM-50-50
 - 27 c. Finish: Clear Anodized Aluminum.
 - 28 3. Reveal Channel Screed
 - 29 a. Manufacturer: Fry Reglet
 - 30 b. Product Number: DCS-50-V-50 (1/2" reveal depth x 1/2" reveal width
 - 31 c. Finish: Clear Anodized Aluminum
- 32 N. Shelving System (MA-#):
 - 33 1. Manufacturer: Knapé & Vogt.
 - 34 2. Model: 85/185 Series, Extra-Duty
 - 35 3. Standards: 85 WH 84
 - 36 4. Brackets: 185 WH 18

37 **2.5 MISCELLANEOUS MATERIALS**

- 38 A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15
39 percent moisture content.
- 40 B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide
41 metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip
42 galvanized anchors and inserts at inside face of exterior walls and at floors.
- 43 C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- 44 D. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of
45 Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions
46 from Indoor Sources Using Environmental Chambers."
- 47 E. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 48 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

49 **2.6 FABRICATION**

- 50 A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium-grade interior woodwork
51 complying with referenced quality standard.
- 52 B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture
53 content in relation to ambient relative humidity during fabrication and in installation areas.
- 54 C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
55

- 1 D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the
2 following:
3 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16
4 inch.
5 2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
6 3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.
7 E. Complete fabrication, including assembly and hardware application, to maximum extent possible before
8 shipment to Project site. Disassemble components only as necessary for shipment and installation. Where
9 necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
10 F. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and
11 similar items. Locate openings accurately and use templates or roughing-in diagrams to produce
12 accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
13 G. Install glass to comply with applicable requirements in Section 08 80 00 "Glazing" and in GANA's "Glazing
14 Manual." For glass in wood frames, secure glass with removable stops.

15 **PART 3 - EXECUTION**

16 **3.1 PREPARATION**

- 17 A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

18 **3.2 INSTALLATION**

- 19 A. Grade: Install cabinets to comply with same grade as item to be installed.
20 B. Install cabinet level, plumb, true, and straight. Shim as required with concealed shims. Install level and
21 plumb to a tolerance of 1/8 inch in 96 inches.
22 C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
23 D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk,
24 concealed fasteners and blind nailing. Use fine finishing nails[or finishing screws] for exposed fastening,
25 countersunk and filled flush with woodwork.
26 E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned.
27 Adjust hardware to center doors and drawers in openings and to provide unencumbered operation.
28 Complete installation of hardware and accessory items as indicated.
29 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight
30 line.
31 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c.
32 with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall
33 finish.

34 **END OF SECTION**

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SECTION 07 19 00

WATER REPELLENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes penetrating water-repellent treatments for the following vertical and horizontal surfaces:
 - 1. Natural stone.
- B. Related Requirements:
 - 1. Section 04 43 13.13 "Anchored Stone masonry Veneer" water repellent to be applied to stone masonry assemblies.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's printed statement of VOC content.
 - 2. Include manufacturer's standard colors.
 - 3. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.
- B. Samples: For each type of water repellent and substrate indicated, 12 by 12 inches in size, with specified water-repellent treatment applied to half of each Sample.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Applicator.
- B. Product Certificates: For each type of water repellent.
- C. Preconstruction Test Reports: For water-repellent-treated substrates.
- D. Field quality-control reports.
- E. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.
- B. Mockups: Provide installation on masonry mockup stone substrate required to demonstrate aesthetic effects, for preconstruction testing, and to set quality standards for materials and execution.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing: Engage a qualified testing agency to perform preconstruction testing of water repellents on field mockups.
 - 1. In addition to verifying performance requirements, use mockups to verify manufacturer's written instructions for application procedure and optimum rates of product application to substrates.
 - 2. Propose changes to materials and methods to suit Project.
 - 3. Notify Architect seven days in advance of the dates and times when mockups will be tested.

1.8 FIELD CONDITIONS

- A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
1. Ambient temperature is above 40 deg F and below 100 deg F and will remain so for 24 hours.
 2. Substrate is not frozen and substrate-surface temperature is above 40 deg F and below 100 deg F.
 3. Rain or snow is not predicted within 24 hours.
 4. Not less than 24 hours have passed since surfaces were last wet.
 5. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Applicator agree(s) to repair or replace materials that fail to maintain water repellency specified in "Performance Requirements" Article within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Performance: Water repellents shall meet the following performance requirements as determined by preconstruction testing on substrates representing those indicated for this Project.
- B. Water Absorption: Minimum 80 percent reduction of water absorption after 24 hours for treated compared to untreated specimens when tested according to the following:
1. Natural Stone: ASTM C 97/C 97M.
- C. Durability: Maximum 5 percent loss of water-repellent performance after 2500 hours of weathering according to ASTM G 154 compared to water-repellent-treated specimens before weathering.

2.2 PENETRATING WATER REPELLENTS

- A. Silane/Siloxane-Blend, Penetrating Water Repellent: Clear, silane and siloxane blend with 800 g/L or less of VOCs.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Sure Klean® Weather Seal Natural Stone Treatment Water Repellent as manufactured by PROSOCO, Inc or comparable product by one of the following:
 - a. Euclid Chemical Company (The); an RPM company.
 - b. Pecora Corporation.
- B. Technical Data:
1. Form: Clear, slightly yellow liquid; mild petroleum odor.
 2. Specific Gravity: 0.805.
 3. Weight/Gallon: 6.70 pounds.
 4. pH: not applicable.
 5. Active Content: 11 percent.
 6. Total Solids: 9 percent ASTM D2369.
 7. Flash Point: 118 degrees F (48 degrees C) ASTM D 3278.
 8. Freeze Point: less than -22 degrees F (less than -30 degrees C).
 9. VOC Content: 713 grams per Liter. Manufactured and marketed in compliance with USEPA AIM VOC regulations (40 CFR 59.403).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
 - 1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in three representative locations by method recommended by manufacturer.
 - 2. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
 - 3. Verify that required repairs are complete, cured, and dry before applying water repellent.
- B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions and as follows:
 - 1. Natural Stone: [ASTM C 1515.][ASTM D 5107.][Section 04 01 10 "Masonry Cleaning."]
- B. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.
- C. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.
- D. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.

3.3 APPLICATION

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.
- B. Apply coating of water repellent on surfaces to be treated using 15 psi-pressure spray with a fan-type spray nozzle to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated.
- C. Apply a second saturation coating, if determined by preconstruction testing, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.4 FIELD QUALITY CONTROL

- A. Coverage Test: In the presence of Architect, hose down a dry, repellent-treated surface to verify complete and uniform product application. A change in surface color will indicate incomplete application.
 - 1. Notify Architect seven days in advance of the dates and times when surfaces will be tested.
 - 2. Reapply water repellent until coverage test indicates complete coverage.

3.5 CLEANING

- A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.
- B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07 19 00

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SECTION 07 21 00
THERMAL INSULATION

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24 **PART 1 - GENERAL**

25 **1.1 RELATED DOCUMENTS**

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

28 **1.2 SUMMARY**

- 29 A. Section Includes:
- 30 1. Extruded polystyrene foam-plastic board.
 - 31 2. Polyisocyanurate foam-plastic board.
 - 32 3. Mineral-wool blanket.
 - 33 4. Mineral-wool board.

34 **1.3 ACTION SUBMITTALS**

- 35 A. Product Data: For each type of product.
- 36 B. Sustainable Design Submittals:
- 37 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and
38 cost.
 - 39 2. Product Data: For adhesives, indicating VOC content.
 - 40 3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting
41 materials.

42 **1.4 INFORMATIONAL SUBMITTALS**

- 43 A. Product test reports.
- 44 B. Research reports.
- 45

- 1 **1.5 DELIVERY, STORAGE, AND HANDLING**
2 A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other
3 sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling,
4 storing, and protecting during installation.
5 B. Protect foam-plastic board insulation as follows:
6 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
7 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until
8 just before installation time.
9 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of
10 construction.

11 **PART 2 - PRODUCTS**

12 **2.1 MOLDED POLYSTYRENE FOAM-PLASTIC BOARD**

- 13 A. Molded Polystyrene Board (**INSUL-2**)
14 1. Type IX: ASTM C 578, Type IX, 25-psi (173-kPa) minimum compressive strength.
15 2. Thermal Resistance Values (R): 4.20.
16 3. Water Vapor Permeability (perm-in; maximum): 2.5.
17 4. Water Absorption by Total (% by Vol, Max): 2.0.

18 **2.2 MINERAL-WOOL (INSUL-1)**

- 19 A. Insulation for miscellaneous voids.
20 B. Recycled Content: Postconsumer recycled content plus one-half of Pre-consumer recycled content not less
21 than 35 percent. Pre consumer = 70%. Post-consumer = 0%.
22 C. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of
23 fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per
24 ASTM E 84; passing ASTM E 136 for combustion characteristics.
25 1. R value = 4.2/inch.
26 1. Basis-of-Design Product: Subject to compliance with requirements provide Knauf Insulation:
27 Commercial Building Insulation (CBI), available manufacturers offering products that may be
28 incorporated into the Work include, but are not limited to the following:
29 a. Knauf Insulation: Commercial Building Insulation (CBI)
30 b. Industrial Insulation Group, LLC (IIG-LLC).
31 c. Roxul Inc.
32 d. Thermafiber Inc.; an Owens Corning company.

33 **2.3 CONTINUOUS INSULATION (CLASS A) WALL INSULATION (INSUL-3)**

- 34 A. Physical properties (Foam Core):
35 1. Flame Spread Index : ASTM E 84, less than 25
36 2. Smoke Developed: ASTM E 84, less than 250.
37 3. Water Absorption: ASTM C 209, less than 0.1 percent by volume.
38 4. Janka Ball Test: ASTM D 1037-12, 15.
39 5. Compressive Strength: ASTM D 1621; Type I; Grade 3, 25 psi (172 kPa).
40 6. Dimensional Stability: ASTM D 2126, 2 percent linear change (7 days).
41 7. Moisture Vapor Permeance: ASTM E 96, 1.1 perm (57.5ng/(Pa•s•m²)).
42 8. Air Permeance of Building Material: ASTM E 2178, less than 0.001 L(s.m²) at 75 Pa
43 9. Resistance to Mold: ASTM D 3273 Passed (10).
44 10. Service Temperature: Minus 100 degrees to 250 degrees F (Minus 73 degrees C to 122 degrees C)
45 B. Continuous Insulation wall panels shall meet the continuous insulation standards of ASHRAE 90.1-2010,
46 IECC 2015 and IBC Chapter 26.
47 C. Continuous Insulation wall panels shall be evaluated and listed under DRJ TER #1402-01. Tests include:
48 1. Foam core flame spread index of 25 or less and smoke developed of 250 or less when tested in
49 accordance with ASTM E 84 or UL 723.
50 2. Classified as Type II, Class 2 in accordance with ASTM C 1289.

- 1 D. Basis of Design: Hunter Panels Xci CG (Class A) is a high thermal resistive rigid insulation panel composed
2 of a closed cell polyisocyanurate foam core bonded on one side to a premium performance polymer bonded
3 glass mat facer on both sides.
4 1. Type: ASTM C 1289, Type II, Class 2:
5 a. Grade 3 (25 psi).
6 2. Panel Size:
7 a. 4 feet by 8 feet (1220 mm by 2440 mm).
8 b. Provide to the thickness indicated on the Drawings.
9 E. Panel fasteners shall be corrosion resistant type as approved Hunter Panel fasteners. Length of fasteners
10 shall be as recommended by the panel manufacturer.

11 **2.4 VENTILATED NAILBASE (INSUL-5)**

- 12 A. Construction: 1/2 inch Plywood, 1 inch Airspace, 5 inches Insulation.
13 B. Basis of Design: ThermaCal® 1 Ventilated Roof Insulation Panels from GAF Cornell.
14 1. Sheathing: 1/2 inch Plywood.
15 2. Airspace: 1 inch.
16 3. Insulation: Polyisocyanurate.
17 4. Panel Thickness: 6-1/2 inches.
18 5. R-Value: 30.
19 C. Fastener Requirements:
20 D. Manufacturer requires the use of its fasteners for steel and wood substrate applications for all nail base roof
21 insulation panels.
22 1. Fasteners and spacing shall meet Factory Mutual wind load requirements.

23 **2.5 ACCESSORIES**

- 24 A. Insulation for Miscellaneous Voids:
25 1. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-
26 spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
27 B. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.

28 **2.6 COMPOSITE FRAMING SUPPORT (CFS) SYSTEM (TBF)**

- 29 A. Composite framing support (CFS) system with in-fill insulation integrated with metal wall panels.
30 1. Basis of Design: Advanced Architectural Products (A2P): SMARTci GreenGirt 1-in-1 System.
31 2. Install CFS system components horizontally on masonry or concrete substrate system with shims
32 as indicated on drawings in compliance with specified requirements.
33 B. CFS System: Provide CFS system consisting of polyester and vinyl ester bioresin matrix (FRP) with recycled
34 materials, fire retardant additives and integral continuous metal inserts the length of profile. Reinforce CFS
35 system with glass strand rovings used internally for longitudinal (lengthwise) strength and continuous strand
36 glass mats or stitched reinforcements used internally for transverse (crosswise) strength.
37 1. Depth of GreenGirt: As indicated or required.
38 2. On Center Spacing: As indicated or required.
39 3. Provide continuous non-corrosive steel insert for engagement of fasteners, at least 16 gage thick
40 with G90 galvanized coating designation in compliance with ASTM A653/A653M.
41 a. Fully engage steel insert with adjacent CFS at ends.
42 b. Anchor sub-girts and other wall cladding support accessories to steel insert set into and part
43 of CFS.
44 c. Provide screw pullout testing that meets or exceeds manufacturer's recommended
45 performance.
46 4. Provide integral compression seal in CFS sections to ensure insulation panel will not dislodge.
47 5. Provide integral anti-siphon grooves on exterior and interior flanges of CFS.
48 6. Provide force distribution zones integrally designed into profile of CFS.
49 7. Surface Burning Characteristics:
50 a. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84.
51 b. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
52 8. Flammability: Comply with ASTM E84.
53 9. Self-Extinguishing: Comply with ASTM D635.
54 10. Profile Visual Requirements: Comply with ASTM D4385.
55 11. Tensile Stress: Provide engineered lengthwise and crosswise tensile stress in compliance with
56 performance loading criteria and specified safety factors, in accordance with ASTM D638.
57 12. Compressive Stress: Provide engineered lengthwise and crosswise compressive stress in
58 compliance with performance loading criteria and specified safety factors, in accordance with
59 ASTM D695.

- 1 13. Flexural Stress: Provide engineered lengthwise and crosswise flexural stress in compliance with
- 2 performance loading criteria and specified safety factors, in accordance with ASTM D790.
- 3 14. Modulus of Elasticity: Engineered to meet performance loading criteria and specified safety
- 4 factors.
- 5 15. Barcol Hardness: 45, in accordance with ASTM D2583.
- 6 16. Water Absorption: Less than 0.46 percent by weight, within 24 hours, tested in accordance with
- 7 ASTM D570.
- 8 17. Density: Within range of 0.062 to 0.070 lbs/cubic inch, in accordance with ASTM D792.
- 9 18. Lengthwise Coefficient of Thermal Expansion: 7.0×10^{-6} inch/inch/degrees F, in accordance with
- 10 ASTM D696.
- 11 19. Notched Izod Impact, Lengthwise: 24 ft lbs/inch, in accordance with ASTM D256 within
- 12 temperature range indicated.
- 13 20. Notched Izod Impact, Crosswise: 4 ft lbs/inch, in accordance with ASTM D256 within temperature
- 14 range indicated.
- 15 C. Assemble CFS system using manufacturer's standard procedures and processes identical to tested units
- 16 and as necessary to comply with performance requirements indicated.
- 17 1. Comply with CFS system and dimensional and structural requirements as indicated on drawings.
- 18 2. Erect CFS system in established sequence in accordance with manufacturer's standard installation
- 19 procedures.
- 20 3. Provide spray foam sealant on backside of cantilevered fasteners that completely puncture
- 21 insulation layer.
- 22 D. Fasteners: Corrosion-resistant, self-tapping and self-drilling screws, bolts, nuts, and other fasteners as
- 23 recommended by CFS system manufacturer for project application.

24 **PART 3 - EXECUTION**

25 **3.1 PREPARATION**

- 26 A. Clean substrates of substances that are harmful to insulation, including removing projections capable of
- 27 puncturing insulation or vapor retarders, or that interfere with insulation attachment.

28 **3.2 INSTALLATION, GENERAL**

- 29 A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- 30 B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or
- 31 snow at any time.
- 32 C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with
- 33 insulation. Remove projections that interfere with placement.
- 34 D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths.
- 35 Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total
- 36 thickness or to achieve R-value.

37 **3.3 INSTALLATION OF SLAB INSULATION**

- 38 A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended
- 39 adhesive according to manufacturer's written instructions.
- 40 1. If not otherwise indicated, extend insulation a minimum of **24 inches** below exterior grade line.
- 41 B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger
- 42 end joints and tightly abut insulation units.
- 43 1. If not otherwise indicated, extend insulation a minimum of **24 inches** in from exterior walls.

44 **3.4 COMPOSITE FRAMING SUPPORT (CFS) SYSTEM (TF) INSTALLATION**

- 45 A. Install CFS system in accordance with manufacturer's installation instructions.
- 46 B. Install system to fill-in exterior spaces without gaps or voids, and do not compress insulation panels.
- 47 C. Trim insulation neatly to fit spaces, and insulate miscellaneous gaps and voids.
- 48 D. Fit insulation tight in spaces and tight to exterior side of Mechanical/Electrical services within plane of
- 49 insulation.
- 50 E. Exposed insulation must be protected from open flame.
- 51 F. Exterior wall insulation is not intended to be left exposed for extended periods of time without adequate
- 52 protection.
- 53 G. Install CFS system in compliance with system orientation, sizes, and locations as indicated on drawings.
- 54 H. Shim and align CFS system within installed tolerances of 1/4 inch in 20 feet, non-cumulative, level, plumb,
- 55 and on location lines as indicated.

- 1 **3.5 INSTALLATION OF CAVITY-WALL INSULATION**
- 2 A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on
- 3 inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other
- 4 obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
- 5 1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed
- 6 for this purpose and specified in Section 04 20 00 "Unit Masonry."
- 7 B. Foam-Plastic Board Insulation: Insulation for Thermally Broken Girt System.
- 8 1. Refer to wall systems specifications and drawings.
- 9 **3.6 INSTALLATION OF INSULATION IN VOID SPACES AND OPEN JOINTS**
- 10 A. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent
- 11 gaps in insulation using the following materials:
- 12 1. Loose Mineral Wool: Compact to approximately 40 percent of normal maximum volume equaling a
- 13 density of approximately 2.5 lb/cu. ft.
- 14 2. Spray Polyurethane Insulation: Low expansion foam.
- 15 **3.7 PROTECTION**
- 16 A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other
- 17 causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be
- 18 concealed and protected by permanent construction immediately after installation.

19 **END OF SECTION**

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SECTION 07 21 19

FOAMED-IN-PLACE INSULATION

PART 1 – GENERAL

- 1.1 [RELATED DOCUMENTS](#)
- 1.2 [SUMMARY](#)
- 1.3 [ACTION SUBMITTALS](#)
- 1.4 [INFORMATIONAL SUBMITTALS](#)
- 1.5 [QUALITY ASSURANCE](#)

PART 2 – PRODUCTS

- 2.1 [WATER-BLOWN, CLOSED CELL, POLYURETHANE SPRAY FOAM INSULATION \(INSUL-4\)](#)
- 2.2 [ACCESSORY MATERIALS](#)

PART 3 – EXECUTION

- 3.1 [PREPARATION](#)
- 3.2 [INSTALLATION](#)
- 3.3 [FIELD QUALITY CONTROL](#)
- 3.4 [PROTECTION](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Closed-cell spray polyurethane foam (SPF) air barrier in exterior wall assemblies (**INSUL-4**).

1.3 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's product data, manufacturer's printed instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.
 - 1. Submit letter from primary materials manufacturer indicating approval of products not manufactured by primary manufacturer.
 - 2. Include statement that materials are adhesively and chemical compatible with adjacent materials proposed for use.
 - 3. Submit reports indicating that field peel-adhesion test on all materials to which sealants are adhered have been performed and the changes made, if required, to other approved materials, in order to achieve successful adhesion.
 - 4. Submit research / evaluation report for foam plastic insulation from ICC-ES or equivalent.
 - 5. Submit evidence of compliance of spray polyurethane foam with NFPA 285.
 - 6. Include VOC content of each material.
 - 7. Include statement that materials are compatible with adjacent materials proposed for use.
 - 8. Include recommended values for field adhesion test on each substrate.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1 **PART 2 - PRODUCTS**

2 **2.1 WATER-BLOWN, CLOSED CELL, POLYURETHANE SPRAY FOAM INSULATION (INSUL-4)**

- 3 A. General: Provide insulating materials that comply with requirements and with referenced standards.
- 4 B. Toxicity/Hazardous Materials
- 5 1. Provide products that contain no chemical blowing agents.
- 6 2. Provide products that are "Low-emitting".
- 7 3. Provide products that contain no PBDE's .
- 8 4. Provide products that contain no urea-formaldehyde.
- 9 C. Basis of Design: ICYNENE ProSeal Eco™ (MD-R-210)
- 10 D. Spray Foam Insulation: Medium-density, water-blown, conforming to the following:
- 11 1. Thermal Resistance (for 1 inch of material) (R-Value/inch @75 deg F): ASTM C 518; 4.86 hr.sq
- 12 ft.degree F/BTU
- 13 2. Aged Thermal Resistance – 1 inch (180 days) (ASTM C518): R-4.9 @ 1 inch.
- 14 3. Air Permeance (for 1.3 inch of material): ASTM E 2178: <0.00049 L/s.m² @75 Pa
- 15 4. Water Vapor Transmission (for 2.5 inches of material): ASTM E 96; less than 1 perm
- 16 5. Resistance to Fungal Growth: ASTM C 1338: no growth
- 17 6. Flame Spread and Smoke Developed Rating: ASTM E 84
- 18 a. Flame Spread: Less than 20
- 19 b. Smoke Development: Less than 450

20 **2.2 ACCESSORY MATERIALS**

- 21 A. Sealant at Transitions in Substrate and Connections to Adjacent Elements: Low-modulus pre-cured silicone
- 22 extrusion and sealant for bonding extrusions to substrates; Spectrem Simple Seal by Tremco or Bondaflex
- 23 Silbridge 300 by May National Associates.
- 24 B. Transition Membrane Between Air Barrier Membrane and Roofing and Other Adjacent Materials: Comply
- 25 with both air barrier manufacturer's recommendations and material manufacturer's recommendations.
- 26 1. Air-Shield by W. R. Meadows, Inc.
- 27 2. Blueskin by Henry Corp.
- 28 3. CCW 705 by Carlisle Coatings & Waterproofing.
- 29 C. Foam stop angle: Metal or plastic angle used for foam stop
- 30 1. Cold rolled galvanized metal.
- 31 2. Aluminum.
- 32 3. Stainless steel.
- 33 4. Extruded plastic equal to Jam-Ex by EXO-TEC Manufacturing, Inc.
- 34 D. Primers: Use primers when deemed necessary for SPF adhesion to substrates.
- 35 E. Portable SPF Application Units: Class 1, nominal 2 lb per cubic foot density, closed-cell SPF
- 36 1. Versi-Foam by RHH.
- 37 2. Touch n' Foam by Convenience Products.
- 38

1 **PART 3 - EXECUTION**

2 **3.1 PREPARATION**

- 3 A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.
4 B. Transition Strip Installation: Install transition strip materials to provide continuity throughout the building
5 envelope. Install materials in accordance with manufacturer's recommendations and the following:

6 **3.2 INSTALLATION**

- 7 A. Comply with insulation manufacturer's written instructions applicable to products and applications.
8 B. Spray insulation to envelop entire area to be insulated and fill voids.
9 C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray
10 into rising foam.
11 D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on
12 Drawings.
13 E. Cavity Walls: Install into cavities to thickness indicated on Drawings.
14 F. Miscellaneous Voids: Apply according to manufacturer's written instructions.

15 **3.3 FIELD QUALITY CONTROL**

- 16 A. Installer self-inspection: The installer shall conduct daily inspections and record the results of these
17 inspections on a Daily Work Record in accordance with the ABAA Quality Assurance Program. These Daily
18 Work Records shall be made available upon request.

19 **3.4 PROTECTION**

- 20 A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other
21 causes.
22

END OF SECTION 07 21 19

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SECTION 07 25 00

WEATHER BARRIERS

PART 1 – GENERAL

- [1.1 RELATED DOCUMENTS](#)
- [1.2 SUMMARY](#)
- [1.4 ACTION SUBMITTALS](#)
- [1.5 INFORMATIONAL SUBMITTALS](#)

PART 2 – PRODUCTS

- [2.1 WATER-RESISTIVE BARRIER](#)
- [2.2 MISCELLANEOUS MATERIALS](#)

PART 3 – EXECUTION

- [3.1 WATER-RESISTIVE BARRIER INSTALLATION](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Building paper.
- B. Related Requirements:
 - 1. Section 06 16 00 "Sheathing" for sheathing joint and penetration treatment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For water-resistive barrier, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.
 - 1. Minimum Weight: 11.5 pounds per square.
 - 2. Permeance: No less than 5 perms dry.

2.2 MISCELLANEOUS MATERIALS

- A. Nails and Staples: ASTM F 1667.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:
 - 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- C. Double-Layer WRB (2-ply): Install a 19-inch- (483-mm-) wide starter course and completely cover with a 36-inch- (914-mm-) wide second course. Install succeeding 36-inch- (914-mm-) wide courses lapping previous courses 19 inches (483 mm) in shingle fashion. Lap ends a minimum of 6 inches (152 mm). Stagger end laps between succeeding courses at least 72 inches (1829 mm). Fasten to sheathing with galvanized staples or roofing nails.

END OF SECTION 07 25 00

SECTION 07 27 15

NONBITUMINOUS SELF-ADHERING SHEET AIR BARRIERS

PART 1 – GENERAL

- 1.1 [RELATED DOCUMENTS](#)
- 1.2 [SUMMARY](#)
- 1.3 [DEFINITIONS](#)
- 1.4 [PREINSTALLATION MEETINGS](#)
- 1.5 [ACTION SUBMITTALS](#)
- 1.6 [INFORMATIONAL SUBMITTALS](#)
- 1.7 [QUALITY ASSURANCE](#)
- 1.8 [DELIVERY, STORAGE, AND HANDLING](#)
- 1.9 [FIELD CONDITIONS](#)

PART 2 – PRODUCTS

- 2.1 [MATERIALS](#)
- 2.2 [PERFORMANCE REQUIREMENTS](#)
- 2.3 [NONBITUMINOUS SHEET AIR BARRIER \(WAVB\)](#)
- 2.4 [NONBITUMINOUS SHEET WATERPROOFING \(WP-1\)](#)
- 2.5 [ACCESSORY MATERIALS](#)

PART 3 – EXECUTION

- 3.1 [EXAMINATION](#)
- 3.2 [SURFACE PREPARATION](#)
- 3.3 [INSTALLATION](#)
- 3.4 [FIELD QUALITY CONTROL](#)
- 3.5 [CLEANING AND PROTECTION](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Self-adhering, vapor-retarding, non-bituminous sheet air barriers for sealing above grade walls.
 - 2. Self-adhering, vapor-retarding, non-bituminous sheet waterproofing for below grade walls.
- B. Related Requirements:
 - 1. Section 06 16 00 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.
 - 2. Section 07 25 00 "Weather Barriers" for building paper used as weather barrier.

1.3 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; and tested physical and performance properties of products.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.

- 1 B. Sustainable Design Submittals:
- 2 1. Product Data: For coatings, indicating VOC content.
- 3 2. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting
- 4 materials.
- 5 C. Shop Drawings: For air-barrier assemblies.
- 6 1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project
- 7 conditions.
- 8 2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside
- 9 corners, terminations, and tie-ins with adjoining construction.
- 10 3. Include details of interfaces with other materials that form part of air barrier.
- 11 **1.6 INFORMATIONAL SUBMITTALS**
- 12 A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by
- 13 Installer, who work on Project.
- 14 B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory
- 15 materials with Project materials that connect to or that come in contact with air barrier.
- 16 C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- 17 D. Field quality-control reports.
- 18 **1.7 QUALITY ASSURANCE**
- 19 A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by
- 20 manufacturer.
- 21 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall
- 22 employ ABAA-certified installers and supervisors on Project.
- 23 **1.8 DELIVERY, STORAGE, AND HANDLING**
- 24 A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- 25 B. Protect stored materials from direct sunlight.
- 26 **1.9 FIELD CONDITIONS**
- 27 A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures
- 28 recommended in writing by air-barrier manufacturer.
- 29 1. Protect substrates from environmental conditions that affect air-barrier performance.
- 30 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.
- 31 B. Maximum exposure time of the air barrier assembly without cover or cladding is 12 months.

32 **PART 2 - PRODUCTS**

33 **2.1 MATERIALS**

- 34 A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from
- 35 single manufacturer.
- 36

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. Assembly Performance:
 - 1. Standards Compliance:
 - a. ASTM E 2357.
 - b. CAN/ULC-S741.
 - c. CAN/ULC-S742.
 - 2. Air Leakage: ASTM E2357:
 - a. Opaque Wall: Less than 0.002 cfm/ft² at 1.57 psf (0.01 L/s/m² at 75 Pa).
 - b. Penetrated Wall: Less than 0.006 cfm/ft² at 1.57 psf (0.03 L/s/m² at 75 Pa).
 - 3. Loads from imposed pressures: Withstands design wind, fan, and stack pressures, both positive and negative, without damage or displacement of the air barrier assembly or adjacent materials. Allows transfer of these loads to the structure.
 - 4. Movement: Allows for thermal, creep, and anticipated seismic and building movement within the air barrier assembly, each air barrier detail, and transitions to adjacent systems without breaching the air barrier system or negating specified air leakage performance.
 - 5. Continuity: Joins air barrier materials and adjacent compatible materials and systems preventing air leakage and maintaining specified air leakage performance at the following locations and as shown on the Drawings:
 - a. Transitions from roof air barrier to wall.
 - b. Transitions from window, curtain wall, storefront, louvers, and doors to wall.
 - c. Transitions from foundation waterproofing to wall.
 - d. Transitions from one type of exterior cladding to another.
 - e. Across construction, control, expansion, and seismic joints.
 - f. Penetrations of utilities, pipes, conduit, and ducts.
 - g. Penetrations of ties, anchors, and channels for exterior finishes.
 - h. Pathways for potential air leakage into the building envelope.

2.3 NONBITUMINOUS SHEET AIR BARRIER (WAVB)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide 3M Air and Vapor Barrier 3015, self-adhered, vapor-impermeable or comparable product by one of the following:
 - 1. Blueskin SA manufactured by Henry
 - 2. Tremco, Inc., ExoAir 110AT.
 - 3. Carlisle Coatings & Waterproofing Inc.
- B. Description: Tan colored, semi-transparent proprietary film with acrylic adhesive and silicone coated release liner.
 - 1. Impermeable to air, water vapor, and water.
 - 2. Resists UV exposure for up to 12 months.
 - 3. Meets requirements of ASTM E2178 and CAN/ULC S741-8.
 - 4. Weight: 13.4 oz/sq.yd. (464 g/sq.m.).
 - 5. Total Membrane Thickness (ASTM D3652): 10 mils (0.25 mm).
 - 6. Air Permeance: Not to exceed 0.00005 cubic feet per minute per square foot under a pressure differential of 0.3 inch water (1.57 psf) (0.0002 L/sm at 75 Pa) when tested in accordance with ASTM E2178.
 - 7. Elongation at Break (ASTM D882): 700 percent.
 - 8. Tensile Strength (ASTM D882): 1740 psi (12 MPa).
 - 9. Lap Adhesion (ASTM D3330): 40 oz/inch (0.44 N/mm).
 - 10. Low Temperature Flexibility (ASTM D1970, Section 7.6): At -22 degrees F (-30 degrees C) passes bend test and no leakage during water head test.
 - 11. Nail Sealability:
 - a. ASTM D1970, Section 7.9: 5 inches (127 mm) of water head after 3 days, dry and passes.
 - b. ASTM E331/547, as modified per AAMA-711-07, Annex 1: Passes initial and after thermal cycling.
 - 12. Water Vapor Permeance (ASTM E96, Water method): Not to exceed 1 US Perm (57 ng/Pa s m²).
 - 13. Water Resistance (AATCC-127): Deviated, 2.16 inches (55 cm) of water for 5 hours; no leakage.
 - 14. Service Temperature: -40 to 240 degrees F (-40 to 80 degrees C).
 - 15. Flammability:

- 1 a. ASTM E84: Flame spread index less than 15, smoke developed value less than 45. Rating:
2 Class A.
3 b. Membrane in an approved wall assembly meets performance requirements of NFPA 285.

4 **2.4 NONBITUMINOUS SHEET WATERPROOFING (WP-1)**

- 5 A. Basis-of-Design Product: Subject to compliance with requirements, provide 3M Air and Vapor Barrier 3015,
6 self-adhered, vapor-impermeable waterproofing system

7 **2.5 ACCESSORY MATERIALS**

- 8 A. Requirement: Provide primers, transition strips, termination strips, joint sealants, counterflashing strips,
9 flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives,
10 tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-
11 barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-
12 barrier material and adjacent construction to which they may seal.
13 B. Primer for Difficult Substrates: Test adhesion before application:
14 1. 3M Hi-Strength 90 Spray Adhesive.
15 2. 3M Hi-Strength 94 ET Spray Adhesive.
16 3. 3M Scotch-Weld Holdfast 70.
17 4. 3M Fastbond Contact Adhesive 30NF.
18 C. Flashing Tape: 3M Self-Adhered Air and Vapor Barrier 3015TWF Membrane in detail widths.
19 1. Description: Tan colored, semi-transparent proprietary film with acrylic adhesive and silicone coated
20 release liner.
21 2. Total Thickness (ASTM D3652): 10 mils (0.25 mm).
22 D. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, **[0.0187 inch] [0.0250 inch] <Insert dimension>**
23 thick, and Series 300 stainless-steel fasteners.

24 **PART 3 - EXECUTION**

25 **3.1 EXAMINATION**

- 26 A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and
27 other conditions affecting performance of the Work.
28 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
29 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier
30 manufacturer.
31 3. Verify that substrates are visibly dry and free of moisture.[Test concrete substrates for capillary
32 moisture by plastic sheet method according to ASTM D 4263.]
33 4. Verify that masonry joints are flush and completely filled with mortar.
34 B. Proceed with installation only after unsatisfactory conditions have been corrected.

35 **3.2 SURFACE PREPARATION**

- 36 A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's
37 written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
38 B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other
39 construction.
40 C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating
41 contaminants or film-forming coatings from concrete.
42 D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other
43 voids in concrete with substrate-patching membrane.
44 E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
45 F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to
46 form a smooth transition from one plane to another.
47 G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with
48 stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.
49 H. Bridge isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints
50 with air-barrier accessory material that accommodates joint movement according to manufacturer's written
51 instructions and details.

52 **3.3 INSTALLATION**

- 53 A. Install materials according to air-barrier manufacturer's written instructions and details to form a seal with
54 adjacent construction and ensure continuity of air and water barrier.

- 1 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required
- 2 rate and allow it to dry.
- 3 B. Prepare, treat, and seal inside and outside corners and vertical and horizontal surfaces at terminations and
- 4 penetrations with termination mastic.
- 5 C. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by
- 6 air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.
- 7 D. Apply and firmly adhere air-barrier sheets over area to receive air barrier. Accurately align sheets and
- 8 maintain uniform 2-inches minimum lap widths and end laps. Overlap and seal seams, and stagger end laps
- 9 to ensure airtight installation.
- 10 1. Apply sheets in a shingled manner to shed water.
- 11 2. Roll sheets firmly to enhance adhesion to substrate.
- 12 E. Apply continuous air-barrier sheets over accessory strips bridging substrate cracks, construction, and
- 13 contraction joints.
- 14 F. CMU: Install air-barrier sheet horizontally against the CMU beginning at base of wall. Align top edge of air-
- 15 barrier sheet immediately below protruding masonry ties or joint reinforcement or ties, and firmly adhere in
- 16 place.
- 17 1. Overlap horizontally adjacent sheets a minimum of 2 inches and roll seams.
- 18 2. Apply overlapping sheets with bottom edge slit to fit around masonry reinforcing or ties. Roll firmly
- 19 into place.
- 20 3. Seal around masonry reinforcing or ties and penetrations with termination mastic.
- 21 4. Continue the sheet into all openings in the wall, such as doors and windows, and terminate at points
- 22 to maintain an airtight barrier that is not visible from interior.
- 23 G. Seal top of through-wall flashings to air-barrier sheet with an additional 6-inch-wide, transition strip.
- 24 H. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal
- 25 counterflashings or ending in reglets with termination mastic.
- 26 I. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a
- 27 continuous air barrier.
- 28 1. Coordinate air-barrier installation with installation of roofing membrane and base flashing to ensure
- 29 continuity of air barrier with roofing membrane.
- 30 2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of
- 31 coverage is achieved over each substrate.
- 32 J. Connect and seal exterior wall air-barrier sheet continuously to roofing-membrane air barrier, concrete
- 33 below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall
- 34 systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior
- 35 wall openings, using accessory materials.
- 36 K. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.
- 37 L. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application
- 38 temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- 39 M. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors.
- 40 Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain
- 41 3 inches of contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
- 42 1. Transition Strip: Roll firmly to enhance adhesion.
- 43 N. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous
- 44 penetrations of air-barrier material with foam sealant.
- 45 O. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters.
- 46 Patch with air-barrier sheet extending 6 inches beyond repaired areas in all directions.
- 47 P. Do not cover air barrier until it has been tested and inspected by testing agency.
- 48 Q. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and
- 49 reapply air-barrier components.

50 3.4 FIELD QUALITY CONTROL

- 51 A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections
- 52 under ABAA's Quality Assurance Program.
- 53 B. Testing Agency: Owner will engage Engage a qualified testing agency to perform tests and inspections.
- 54 C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with
- 55 requirements. Inspections may include the following:
- 56 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or
- 57 holes.
- 58 2. Continuous structural support of air-barrier system has been provided.
- 59 3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar
- 60 droppings.
- 61 4. Site conditions for application temperature and dryness of substrates have been maintained.

- 1 5. Maximum exposure time of materials to UV deterioration has not been exceeded.
- 2 6. Surfaces have been primed.
- 3 7. Laps in sheet materials have complied with the minimum requirements and have been shingled in
- 4 the correct direction (or mastic applied on exposed edges), with no fishmouths.
- 5 8. Termination mastic has been applied on cut edges.
- 6 9. Air barrier has been firmly adhered to substrate.
- 7 10. Compatible materials have been used.
- 8 11. Transitions at changes in direction and structural support at gaps have been provided.
- 9 12. Connections between assemblies (air barrier and sealants) have complied with requirements for
- 10 cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
- 11 13. All penetrations have been sealed.
- 12 D. Tests: As determined by testing agency from among the following tests:
- 13 1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage
- 14 according to [ASTM E 1186, chamber pressurization or depressurization with smoke tracers]
- 15 [ASTM E 1186, chamber depressurization using detection liquids] <Insert requirement>.
- 16 2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to
- 17 ASTM E 783.
- 18 3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according
- 19 to ASTM D 4541 for each 600 sq. ft. of installed air barrier or part thereof.
- 20 E. Air barriers will be considered defective if they do not pass tests and inspections.
- 21 1. Apply additional air-barrier material, according to manufacturer's written instructions, where
- 22 inspection results indicate insufficient thickness.
- 23 2. Remove and replace deficient air-barrier components for retesting as specified above.
- 24 F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- 25 G. Prepare test and inspection reports.

26 3.5 CLEANING AND PROTECTION

- 27 A. Protect air-barrier system from damage during application and remainder of construction period, according
- 28 to manufacturer's written instructions.
- 29 1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in
- 30 writing by manufacturer. If exposed to these conditions for longer than recommended, remove and
- 31 replace air barrier or install additional, full-thickness, air-barrier application after repairing and
- 32 preparing the overexposed materials according to air-barrier manufacturer's written instructions.
- 33 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier
- 34 manufacturer.
- 35 B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using
- 36 cleaning agents and procedures recommended in writing by manufacturer of affected construction.

37 **END OF SECTION 07 27 15**

SECTION 07 41 13.16

STANDING-SEAM METAL ROOF PANELS

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section covers the pre-finished, pre-fabricated Architectural standing seam roof system. All metal trim, accessories, fasteners, insulation and sealants indicated on the drawings as part of this section.
- B. Related Sections:
 - 1. Section 07 21 00 "Thermal Insulation" for roof deck composite insulation.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
 - 4. Review structural loading limitations of deck during and after roofing.
 - 5. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
 - 6. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

- 1 **1.4 ACTION SUBMITTALS**
- 2 A. Product Data: For each type of product.
- 3 1. Include construction details, material descriptions, dimensions of individual components and profiles,
- 4 and finishes for each type of panel and accessory.
- 5 B. Shop Drawings:
- 6 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel
- 7 profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and
- 8 special details.
- 9 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than
- 10 1-1/2 inches per 12 inches.
- 11 C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated
- 12 below.
- 13 1. Metal Panels: 12 inches long by actual panel width. Include clips, fasteners, closures, and other metal
- 14 panel accessories.
- 15 **1.5 INFORMATIONAL SUBMITTALS**
- 16 A. Qualification Data: For Installer.
- 17 B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- 18 C. Sample Warranties: For special warranties.
- 19 **1.6 CLOSEOUT SUBMITTALS**
- 20 A. Maintenance Data: For metal panels to include in maintenance manuals.
- 21 **1.7 QUALITY ASSURANCE**
- 22 A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by
- 23 manufacturer.
- 24 B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of
- 25 producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL
- 26 certification of portable roll-forming equipment for duration of work.
- 27 **1.8 DELIVERY, STORAGE, AND HANDLING**
- 28 A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed.
- 29 Package metal panels for protection during transportation and handling.
- 30 B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface
- 31 damage.
- 32 C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated
- 33 covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal
- 34 panels in contact with other materials that might cause staining, denting, or other surface damage.
- 35 D. Retain strippable protective covering on metal panels during installation.
- 36 **1.9 FIELD CONDITIONS**
- 37 A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit
- 38 assembly of metal panels to be performed according to manufacturers' written instructions and warranty
- 39 requirements.
- 40 **1.10 COORDINATION**
- 41 A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual
- 42 equipment provided.
- 43 B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other
- 44 adjoining work to provide a leakproof, secure, and noncorrosive installation.
- 45 C. Coordinate selective demolition of existing standing seam metal roofing. Disassemble and salvage existing
- 46 gutters, downspouts, snow guards, and associated fittings and hardware for reinstallation to the greatest
- 47 extent possible. For removal of existing standing seam roof panels, use mechanical seam cutter to remove
- 48 folded seam and disengage fastening clips. Remove roofing panels, fully intact to the greatest extent
- 49 possible, and stockpile separately in a location designated by Owner for Owner disposal. Disposal of
- 50 remaining demolition waste by Contractor.
- 51

- 1 **1.11 WARRANTY**
2 A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace
3 components of metal panel systems that fail in materials or workmanship within specified warranty period.
4 1. Failures include, but are not limited to, the following:
5 a. Structural failures including rupturing, cracking, or puncturing.
6 b. Deterioration of metals and other materials beyond normal weathering.
7 2. Warranty Period: Two years from date of Substantial Completion.
8 B. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair
9 or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within
10 specified warranty period.
11 1. Warranty Period: 20 years from date of Substantial Completion.

12 **PART 2 - PRODUCTS**

13 **2.1 PERFORMANCE REQUIREMENTS**

- 14 A. General Performance: Metal roof panels shall comply with performance requirements without failure due to
15 defective manufacture, fabrication, installation or other defects in construction.
16 B. Panels to meet:
17 1. Water Penetration: When tested per ASTM E-283/1680 and ASTM E-331/1646 there shall be no
18 uncontrolled water penetration or air infiltration through the panel joints.
19 2. UL 2218 - Impact Resistance rated.
20 C. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following
21 loads, based on testing according to ASTM E 1592:
22 1. Wind Loads: As indicated on Drawings.
23 2. Other Design Loads: As indicated on Drawings.
24 D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by
25 preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of
26 connections, and other detrimental effects. Base calculations on surface temperatures of materials due to
27 both solar heat gain and nighttime-sky heat loss.
28 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
29 E. testing identical products by a qualified testing agency.

30 **2.2 STANDING-SEAM METAL ROOF PANELS**

- 31 A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting
32 raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports
33 using concealed clips in side laps. Include clips, cleats, pressure plates and accessories required for a
34 weathertight installation.
35 B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Wall Panels: Formed with vertical ribs at panel edges and
36 a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports
37 using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and
38 mechanically seaming panels together.
39 1. Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 temper.
40 a. Thickness: 16 oz./sq. ft. Quarter hard.
41 b. Exposed Finish: Mill.
42 2. Clips: One-piece fixed to accommodate thermal movement.
43 a. Material: 0.025-inch-thick, stainless-steel sheet.
44 C. Roof panels shall be roll seam Pittsburgh Lock double seam in 18 inches widths with 1 inch high seams.
45 D. Panels to be produced Smooth - Factory Standard.
46 E. Panels to be designed for attachment with concealed fastener clips, spaced as required by the manufacturer
47 to provide for both positive and negative design loads, while allowing for the expansion and contraction of
48 the entire roof system resulting from variations in temperature.
49 F. Forming: Use continuous end rolling method. No end laps on panels.

50 **2.3 ACCEPTABLE MANUFACTURERS**

- 51 A. Basis-of-Design Product: Subject to compliance with requirements, provide Copper Craft (Euramax Co.) or
52 comparable product by one of the following:
53 1. ATAS international Inc.

- 1 **2.4 UNDERLAYMENT MATERIALS**
- 2 A. Ice/Water: Self-Adhering, High-Temperature Sheet. Minimum 40 mils thick, consisting of a slip-resistant
- 3 polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt
- 4 adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath
- 5 metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
- 6 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
- 7 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
- 8 3. Products:
- 9 a. W.R Grace "Ice & water Shield".
- 10 b. Cetco Strongseal.
- 11 c. Carlisle CCW WIP 300HT.
- 12 d. GAF
- 13 e. Interwrap Titanium PSU.
- 14 f. MFM Corp "Wind & Water Shield".
- 15 g. Polyguard Deck Guard HT of Polyglas HT.
- 16 h. Tamko TW Tile and Metal Underlayment.
- 17 B. Underlayment: A breathable, UV-stabilized polypropylene underlayment.
- 18 1. Construction: Spunbound polypropylene.
- 19 2. Water Vapor Transmission: 16 perms.
- 20 3. UV-stabilized polypropylene construction resists UV degradation for up to 180 days
- 21 4. ICC-ES ESR-2808
- 22 5. Meets or exceeds the physical requirements of ASTM D226 and D4869
- 23 6. Meets UL Class A fire rating when used with UL Class A rated
- 24 7. roof coverings
- 25 8. Products:
- 26 a. Basis of Design: Synthetic Roofing Felt, GAF Deck Armor.
- 27 b. Comparable manufactured products.
- 28 C. Slip Sheet: Rosin Paper;
- 29 **2.5 MISCELLANEOUS MATERIALS**
- 30 A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim,
- 31 copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and
- 32 similar items. Match material and finish of metal panels unless otherwise indicated.
- 33 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
- 34 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material
- 35 recommended by manufacturer.
- 36 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell
- 37 laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match
- 38 metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight
- 39 construction.
- 40 B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal
- 41 against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes,
- 42 corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system
- 43 as adjacent metal panels.
- 44 C. Gutters: Re-use salvaged gutters to greatest extent possible. Replicate existing for new construction
- 45 required.
- 46 D. Downspouts: Re-use salvaged downspouts to greatest extent possible. Replicate existing for new
- 47 construction required.
- 48 E. Continuous Ridge Vent:
- 49 1. Manufacturer's fabrication with storm baffle and insect screen.
- 50 F. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- 51 G. Sealants
- 52 1. Provide two-part polysulfide class B non-sag type for vertical and horizontal joints or one part
- 53 polysulfide not containing pitch or phenolic extenders or
- 54 2. Exterior grade silicone sealant recommended by roofing manufacturer or One part non-sag, gun
- 55 grade exterior type polyurethane recommended by the roofing manufacturer.
- 56

- 1 H. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel
- 2 materials, are nonstaining, and do not damage panel finish.
- 3 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape
- 4 with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch
- 5 wide and 1/8 inch thick.
- 6 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and
- 7 use classifications required to seal joints in metal panels and remain weathertight; and as
- 8 recommended in writing by metal panel manufacturer.
- 9 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

10 2.6 FABRICATION

- 11 A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard
- 12 procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by
- 13 laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- 14 B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated
- 15 on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by
- 16 manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written
- 17 instructions and to comply with details shown.
- 18 C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- 19 D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a
- 20 weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- 21 E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations
- 22 and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions,
- 23 metal, and other characteristics of item indicated.
- 24 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool
- 25 marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- 26 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with
- 27 epoxy seam sealer. Rivet joints for additional strength.
- 28 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams.
- 29 Tin edges to be seamed, form seams, and solder.
- 30 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to
- 31 comply with SMACNA standards.
- 32 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on
- 33 faces of accessories exposed to view.
- 34 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from
- 35 compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
- 36 a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel
- 37 manufacturer for application, but not less than thickness of metal being secured.

38 PART 3 - EXECUTION

39 3.1 EXAMINATION

- 40 A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for
- 41 installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
- 42 1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and
- 43 other structural panel support members and anchorages have been installed within alignment
- 44 tolerances required by metal roof panel manufacturer.
- 45 2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and
- 46 that installation is within flatness tolerances required by metal roof panel manufacturer.
- 47 a. Verify that air- or water-resistive barriers have been installed over sheathing or backing
- 48 substrate to prevent air infiltration or water penetration.
- 49 B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of
- 50 penetrations relative to seam locations of metal panels before installation.
- 51 C. Proceed with installation only after unsatisfactory conditions have been corrected.
- 52

- 1 **3.2 UNDERLAYMENT INSTALLATION**
2 A. Ice and Water:
3 1. Apply over the roof area indicated below:
4 a. Roof perimeter for a distance up from eaves of 24 inches beyond interior wall line.
5 b. Valleys, from lowest point to highest point, for a distance on each side of 18 inches. Overlap
6 ends of sheets not less than 6 inches.
7 c. Rake edges for a distance of 18 inches.
8 d. Hips and ridges for a distance on each side of 12 inches.
9 e. Roof-to-wall intersections for a distance from wall of 18 inches.
10 f. Around dormers, chimneys, skylights, and other penetrating elements for a distance from
11 element of 18 inches.
12 B. Felt Underlayment: Apply at locations indicated below, in shingle fashion to shed water, and with lapped
13 joints of not less than 2 inches.
14 1. Apply over the entire roof surface.
15 C. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.
16 D. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200
17 "Sheet Metal Flashing and Trim."

- 18 **3.3 METAL PANEL INSTALLATION**
19 A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and
20 locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels
21 and other components of the Work securely in place, with provisions for thermal and structural movement.
22 1. Shim or otherwise plumb substrates receiving metal panels.
23 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not
24 begin installation until air- or water-resistive barriers and flashings that will be concealed by metal
25 panels are installed.
26 3. Install screw fasteners in predrilled holes.
27 4. Locate and space fastenings in uniform vertical and horizontal alignment.
28 5. Install flashing and trim as metal panel work proceeds.
29 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end
30 laps to avoid a four-panel lap splice condition.
31 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten
32 flashings and trim around openings and similar elements with self-tapping screws.
33 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
34 B. Fasteners:
35 1. Copper Panels: Use copper, stainless-steel, or hardware-bronze fasteners.
36 C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using
37 manufacturer's approved fasteners according to manufacturers' written instructions.
38 D. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at
39 each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
40 1. Install clips to supports with self-tapping fasteners.
41 E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting,
42 and provide for thermal expansion. Coordinate installation with flashings and other components.
43 1. Install components required for a complete metal panel system including trim, copings, corners, seam
44 covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated
45 by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel
46 manufacturer.
47 F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions,
48 and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set
49 units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently
50 watertight and weather resistant.
51 1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and
52 levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim
53 to fit substrates and achieve waterproof and weather-resistant performance.
54 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement
55 joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where
56 lapped expansion provisions cannot be used or would not be sufficiently weather resistant and
57 waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled
58 with mastic sealant (concealed within joints).

1 **3.4 ERECTION TOLERANCES**
2 A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet on
3 slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of
4 matching profiles.

5 **3.5 CLEANING AND PROTECTION**
6 A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless
7 otherwise indicated in manufacturer's written installation instructions. On completion of metal panel
8 installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean
9 condition during construction.
10 B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish
11 touchup or similar minor repair procedures.

12 **END OF SECTION 07 41 13.16**

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SECTION 07 41 13.19

STANDING-SEAM METAL WALL PANELS

PART 1 – GENERAL

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes standing-seam metal wall panels (**MP-1**).

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, and installers whose work interfaces with or affects metal panels.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
 - 4. Review procedures for repair of metal panels damaged after installation.
 - 5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Metal Panels: 12 inches long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a mockup submittal for review.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Corner of metal panel cladding system MP-1 at external corner, and at window jamb. Base size on at least three typical panel heights per the elevations and one panel width per manufacturer's typical panel sizes for the design intent.
 - 2. Provide window head and window sill construction in mockup.
 - 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. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.
- E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 STANDING-SEAM METAL WALL PANELS (MP-1)

- A. General: Provide factory-formed metal wall panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
- B. Attach to substrate with continuous seam bracket to reduce oil-canning for horizontal panels. Narrow panel width will require brake-formed fabrication. Provide panel lengths 11 feet long plus seam allowance, and install in running bond pattern.
- C. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Wall Panels: Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports

using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

- D. Attach to substrate with continuous seam bracket to reduce oil-canning for horizontal panels. Narrow panel width likely requires brake-formed fabrication. If so, provide panel lengths 11 feet long plus seam allowance, and install in running bond pattern.
 - 1. Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 temper.
 - a. Thickness: 16 oz./sq. ft..
 - b. Exposed Finish: Mill.
 - 2. Clips: One-piece fixed to accommodate thermal movement.
 - a. Material: 0.025-inch-thick, stainless-steel sheet.
 - 3. Joint Type: Single folded.
 - 4. Panel Coverage: 6.0 inches as detailed.
 - 5. Panel Height: 1.0 inches.

2.2 MISCELLANEOUS MATERIALS

- A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
- B. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- C. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

2.3 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

2.4 FINISHES

- A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 - 1. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels horizontal unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 - 2. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 3. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 - 4. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
- B. Fasteners:
 - 1. Copper Panels: Use copper, stainless-steel, or hardware-bronze fasteners.
- C. Anchor Clips: Anchor metal wall panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Standing-Seam Metal Wall Panel Installation: Fasten metal wall panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
 - 1. Install clips to supports with self-tapping fasteners.
 - 2. Seamed Joint: Crimp standing seams.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturers; or, if not indicated, types recommended by metal wall panel manufacturer.

3.3 CLEANING AND PROTECTION

- A. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 41 13.16

1 SECTION 07 42 13.23

2 METAL WALL PANELS

3 PART 1 – GENERAL

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14 PART 2 – PRODUCTS

- 15 [2.1 PERFORMANCE REQUIREMENTS](#)
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21 PART 3 – EXECUTION

- 22 [3.1 EXAMINATION](#)
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24 [3.3 PREPARATION](#)
25 [3.4 METAL COMPOSITE MATERIAL PANEL INSTALLATION](#)
26 [3.5 ERECTION TOLERANCES](#)
27 [3.6 CLEANING AND PROTECTION](#)

28 PART 1 - GENERAL

29 1.1 RELATED DOCUMENTS

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

32 1.2 SUMMARY

- 33 A. Section includes metal composite material wall panels and supporting extrusions and clips, ACM reveals,
34 and composite framing system.

35 1.3 PREINSTALLATION MEETINGS

- 36 A. Preinstallation Conference: Conduct conference at Project site.
37 1. Meet with Owner, Architect, Owner's insurer if applicable, metal composite material panel Installer,
38 metal composite material panel manufacturer's representative, structural-support Installer, and
39 installers whose work interfaces with or affects metal composite material panels, including installers
40 of doors, windows, and louvers.
41 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel,
42 equipment, and facilities needed to make progress and avoid delays.
43 3. Review methods and procedures related to metal composite material panel installation, including
44 manufacturer's written instructions.
45 4. Examine support conditions for compliance with requirements, including alignment between and
46 attachment to structural members.
47 5. Review flashings, special siding details, wall penetrations, openings, and condition of other
48 construction that affect metal composite material panels.
49 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections
50 if applicable.
51 7. Review temporary protection requirements for metal composite material panel assembly during and
52 after installation.
53 8. Review procedures for repair of panels damaged after installation.

- 1 9. Document proceedings, including corrective measures and actions required, and furnish copy of
2 record to each participant.

3 **1.4 ACTION SUBMITTALS**

- 4 A. Product Data: For each type of product.
5 1. Include construction details, material descriptions, dimensions of individual components and profiles,
6 and finishes for each type of panel and accessory.
7 B. Shop Drawings:
8 1. Include fabrication and installation layouts of metal composite material panels; details of edge
9 conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings,
10 closures, and accessories; and special details.
11 2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2
12 inches per 12 inches.
13 C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated
14 below.
15 1. Metal Composite Material Panels: 12 inches long by actual panel width. Include fasteners, closures,
16 and other metal composite material panel accessories.

17 **1.5 INFORMATIONAL SUBMITTALS**

- 18 A. Sample Warranties: For special warranties.

19 **1.6 QUALITY ASSURANCE**

- 20 A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by
21 manufacturer.
22 B. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a
23 mockup submittal for review.
24 1. Metal Composite Material Wall Panels with the transition between the two cladding systems.

25 **1.7 DELIVERY, STORAGE, AND HANDLING**

- 26 A. Deliver components, metal composite material panels, and other manufactured items so as not to be
27 damaged or deformed. Package metal composite material panels for protection during transportation and
28 handling.
29 B. Unload, store, and erect metal composite material panels in a manner to prevent bending, warping, twisting,
30 and surface damage.
31 C. Stack metal composite material panels horizontally on platforms or pallets, covered with suitable
32 weathertight and ventilated covering. Store metal composite material panels to ensure dryness, with positive
33 slope for drainage of water. Do not store metal composite material panels in contact with other materials
34 that might cause staining, denting, or other surface damage.
35 D. Retain strippable protective covering on metal composite material panels during installation.

36 **1.8 FIELD CONDITIONS**

- 37 A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit
38 assembly of metal composite material panels to be performed according to manufacturers' written
39 instructions and warranty requirements.

40 **1.9 COORDINATION**

- 41 A. Coordinate metal composite material panel installation with rain drainage work, flashing, trim, construction
42 of soffits, and other adjoining work to provide a leak proof, secure, and noncorrosive installation.

43 **1.10 WARRANTY**

- 44 A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace
45 components of metal composite material panel systems that fail in materials or workmanship within specified
46 warranty period.
47 1. Failures include, but are not limited to, the following:
48 a. Structural failures including rupturing, cracking, or puncturing.
49 b. Deterioration of metals and other materials beyond normal weathering.
50 2. Warranty Period: Two years from date of Substantial Completion.
51

- 1 B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair
2 finish or replace metal composite material panels that show evidence of deterioration of factory-applied
3 finishes within specified warranty period.
4 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
5 a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
6 b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
7 c. Cracking, checking, peeling, or failure of paint to adhere to bar metal.
8 2. Finish Warranty Period: 20 years from date of Substantial Completion.

9 **PART 2 - PRODUCTS**

10 **2.1 PERFORMANCE REQUIREMENTS**

- 11 1. Composite panels shall be capable of withstanding building movements and weather exposures
12 based on the following test standards required by the Architect and/or the local building code.
13 a. Wind Load:
14 1) Panels shall be designed to withstand the Design Wind Load based upon the local
15 building code, but in no case less than 20 lb/ft² (959 N/m²) and 30 lb/ft² (1438 N/m²)
16 on parapet and corner panels. Wind load testing shall be conducted in accordance
17 with ASTM E 330 to obtain the following results.
18 a) Normal to the plane of the wall between supports, deflection of the secured
19 perimeter-framing members shall not exceed L/175 or 3/4 inch (19mm),
20 whichever is less.
21 b) Normal to the plane of the wall, the maximum panel deflection shall not exceed
22 L/60 of the full span.
23 2) Maximum anchor deflection shall not exceed 1/16 inch (1.6mm).
24 3) At 1-1/2 times design pressure, permanent deflections of framing members shall not
25 exceed L/100 of span length and components shall not experience failure or gross
26 permanent distortion. At connection points of framing members to anchors,
27 permanent set shall not exceed 1/16 inch (1.6mm).
28 b. Pressure Equalized Rain Screen Systems shall comply with AAMA 508-05 Voluntary Test
29 Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems.

30 **2.2 METAL COMPOSITE MATERIAL WALL PANELS (MCP-1)**

- 31 A. Metal Composite Material Wall Panel Systems: Provide factory-formed and -assembled, metal composite
32 material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic
33 core; formed into profile for installation method indicated. Include attachment assembly components, panel
34 stiffeners, and accessories required for weathertight system.
35 B. Basis of Design: Subject to compliance with requirements, provide Rainscreen II, Insulation Outboard as
36 engineered and fabricated by 3A Composites USA, Inc. or comparable product by one of the following:
37 1. Alcoa Architectural Products (USA).
38 2. ALPOLIC Materials; Mitsubishi Plastics Composites America.
39 3. Citadel Architectural Products, Inc.
40 4. Firestone Metal Products, LLC.
41 5. Protean Construction Products, Inc.
42 C. System Type: Pressure Equalized Rain Screen System:
43 1. A complete system of tested performance complying with performance requirements.
44

- 1 D. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch-thick, coil-coated aluminum sheet
2 facings.
3 1. Panel Thickness: 0.158 inch (4 mm).
4 2. Core: Fire resistive.
5 3. Bond Integrity
6 a. When tested for bond integrity, in accordance with ASTM D 1781 (simulating resistance to
7 panel delamination), there shall be no adhesive failure of the bond a) between the core and
8 the skin nor b) cohesive failure of the core itself below the following values:
9 b. Peel Strength: 100 N-mm/mm (22.5 in lb/in) as manufactured
10 c. Peel Strength: 100 N-mm/mm (22.5 in lb/in) after 21 days soaking in water at 70°F (21°C)
11 4. Fire Performance
12 a. ASTM E 84 Maximum Flame Spread 25, Max. Smoke Developed 450
13 b. NFPA 285 Panels shall meet requirements of the Intermediate Scale Multi Story Test
14 5. Exterior Finish: Two-coat fluoropolymer.
15 a. Color: Match ALUCOBOND; 3A Composites USA, Inc. Refer to material ID Tag list on the
16 Drawings.
- 17 E. System Components:
18 1. Extrusions and Clips: Extrusions, formed members, sheet, and plate shall conform to ASTM B 209
19 and the recommendations of the manufacturer.
20 2. ACM Reveal:
21 3. Weep and Baffle: Installed at panel return at each bottom panel return to achieve drainage and air
22 barrier performance.
23 4. Panel stiffeners: Structurally fastened or restrained at the ends and shall be secured to the rear face
24 of the composite panel with silicone of sufficient size and strength to maintain panel flatness. Stiffener
25 material and/or finish shall be compatible with the silicone.
26 5. Sealants and gaskets within the panel system shall be as per manufacturer's standards to meet
27 performance requirements.
28 6. Fabricate flashing materials from 0.030 inch (0.76mm) minimum thickness aluminum sheet painted
29 to match the panel system where exposed. Provide a lap strap under the flashing at abutted
30 conditions and seal lapped surfaces with a full bed of non-hardening sealant.
31 7. Fasteners (concealed/exposed/non-corrosive): Fasteners as recommended by panel manufacturer.
32 Do not expose fasteners except where unavoidable and then match finish of adjoining metal.

33 **2.3 COMPOSITE FRAMING SUPPORT (CFS) SYSTEM (TBF)**

- 34 A. Composite framing support (CFS) system with in-fill insulation integrated with metal wall panels.
35 1. Basis of Design: Advanced Architectural Products (A2P): SMARTci GreenGirt 1-in-1 System.
36 2. Install CFS system components horizontally on masonry or concrete substrate system with shims
37 as indicated on drawings in compliance with specified requirements.
- 38 B. CFS System: Provide CFS system consisting of polyester and vinyl ester bioresin matrix (FRP) with recycled
39 materials, fire retardant additives and integral continuous metal inserts the length of profile. Reinforce CFS
40 system with glass strand rovings used internally for longitudinal (lengthwise) strength and continuous strand
41 glass mats or stitched reinforcements used internally for transverse (crosswise) strength.
42 1. Depth of GreenGirt: As indicated or required.
43 2. On Center Spacing: As indicated or required.
44 3. Provide continuous non-corrosive steel insert for engagement of fasteners, at least 16 gage thick
45 with G90 galvanized coating designation in compliance with ASTM A653/A653M.
46 a. Fully engage steel insert with adjacent CFS at ends.
47 b. Anchor sub-girts and other wall cladding support accessories to steel insert set into and part
48 of CFS.
49 c. Provide screw pullout testing that meets or exceeds manufacturer's recommended
50 performance.
51 4. Provide integral compression seal in CFS sections to ensure insulation panel will not dislodge.
52 5. Provide integral anti-siphon grooves on exterior and interior flanges of CFS.
53 6. Provide force distribution zones integrally designed into profile of CFS.
54 7. Surface Burning Characteristics:
55 a. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84.
56 b. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
57 8. Flammability: Comply with ASTM E84.
58 9. Self-Extinguishing: Comply with ASTM D635.
59 10. Profile Visual Requirements: Comply with ASTM D4385.
60 11. Tensile Stress: Provide engineered lengthwise and crosswise tensile stress in compliance with
61 performance loading criteria and specified safety factors, in accordance with ASTM D638.

- 1 12. Compressive Stress: Provide engineered lengthwise and crosswise compressive stress in
2 compliance with performance loading criteria and specified safety factors, in accordance with
3 ASTM D695.
4 13. Flexural Stress: Provide engineered lengthwise and crosswise flexural stress in compliance with
5 performance loading criteria and specified safety factors, in accordance with ASTM D790.
6 14. Modulus of Elasticity: Engineered to meet performance loading criteria and specified safety
7 factors.
8 15. Barcol Hardness: 45, in accordance with ASTM D2583.
9 16. Water Absorption: Less than 0.46 percent by weight, within 24 hours, tested in accordance with
10 ASTM D570.
11 17. Density: Within range of 0.062 to 0.070 lbs/cubic inch, in accordance with ASTM D792.
12 18. Lengthwise Coefficient of Thermal Expansion: 7.0×10^{-6} inch/inch/degrees F, in accordance with
13 ASTM D696.
14 19. Notched Izod Impact, Lengthwise: 24 ft lbs/inch, in accordance with ASTM D256 within
15 temperature range indicated.
16 20. Notched Izod Impact, Crosswise: 4 ft lbs/inch, in accordance with ASTM D256 within temperature
17 range indicated.
18 C. Assemble CFS system using manufacturer's standard procedures and processes identical to tested units
19 and as necessary to comply with performance requirements indicated.
20 1. Comply with CFS system and dimensional and structural requirements as indicated on drawings.
21 2. Erect CFS system in established sequence in accordance with manufacturer's standard installation
22 procedures.
23 3. Provide spray foam sealant on backside of cantilevered fasteners that completely puncture
24 insulation layer.
25 D. Fasteners: Corrosion-resistant, self-tapping and self-drilling screws, bolts, nuts, and other fasteners as
26 recommended by CFS system manufacturer for project application.

27 **2.4 MISCELLANEOUS MATERIALS**

- 28 A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim,
29 copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and
30 similar items. Match material and finish of metal composite material panels unless otherwise indicated.
31 B. Flashing and Trim: Provide flashing and trim formed from same material as metal composite material panels
32 as required to seal against weather and to provide finished appearance. Locations include, but are not limited
33 to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits,
34 reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal composite material
35 panels.
36 C. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with
37 heads matching color of metal composite material panels by means of plastic caps or factory-applied
38 coating. Provide EPDM or PVC sealing washers for exposed fasteners.
39 D. Panel Sealants: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use
40 classifications required to seal joints in metal composite material panels and remain weathertight; and as
41 recommended in writing by metal composite material panel manufacturer.

42 **2.5 FABRICATION**

- 43 A. General: Fabricate and finish metal composite material panels and accessories at the factory, by
44 manufacturer's standard procedures and processes, as necessary to fulfill indicated performance
45 requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and
46 structural requirements.
47

- 1 B. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations
2 and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions,
3 metal, and other characteristics of item indicated.
4 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool
5 marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
6 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with
7 epoxy seam sealer. Rivet joints for additional strength.
8 3. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to
9 comply with SMACNA standards.
10 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on
11 faces of accessories exposed to view.
12 5. Fabricate cleats and attachment devices from same material as accessory being anchored or from
13 compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
14 a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel
15 manufacturer for application but not less than thickness of metal being secured.

16 **2.6 FINISHES**

- 17 A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable,
18 temporary protective covering before shipping.
19 B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they
20 are within one-half of the range of approved Samples. Noticeable variations in same piece are not
21 acceptable. Variations in appearance of other components are acceptable if they are within the range of
22 approved Samples and are assembled or installed to minimize contrast.
23 C. Aluminum Panels and Accessories:
24 1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent
25 PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces
26 to comply with coating and resin manufacturers' written instructions.

27 **PART 3 - EXECUTION**

28 **3.1 EXAMINATION**

- 29 A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for
30 installation tolerances, metal composite material panel supports, and other conditions affecting performance
31 of the Work.
32 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support
33 members and anchorage have been installed within alignment tolerances required by metal
34 composite material wall panel manufacturer.
35 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that
36 installation is within flatness tolerances required by metal composite material wall panel
37 manufacturer.
38 a. Verify that air- or water-resistive barriers have been installed over sheathing or backing
39 substrate to prevent air infiltration or water penetration.
40 B. Examine roughing-in for components and assemblies penetrating metal composite material panels to verify
41 actual locations of penetrations relative to seam locations of metal composite material panels before
42 installation.
43 C. Proceed with installation only after unsatisfactory conditions have been corrected.

44 **3.2 COMPOSITE FRAMING SUPPORT (CFS) SYSTEM (TBF) INSTALLATION**

- 45 A. Install CFS system in accordance with manufacturer's installation instructions.
46 B. Install system to fill-in exterior spaces without gaps or voids, and do not compress insulation panels.
47 C. Trim insulation neatly to fit spaces, and insulate miscellaneous gaps and voids.
48 D. Fit insulation tight in spaces and tight to exterior side of Mechanical/Electrical services within plane of
49 insulation.
50 E. Exposed insulation must be protected from open flame.
51 F. Exterior wall insulation is not intended to be left exposed for extended periods of time without adequate
52 protection.
53 G. Install CFS system in compliance with system orientation, sizes, and locations as indicated on drawings.
54 H. Shim and align CFS system within installed tolerances of 1/4 inch in 20 feet, non-cumulative, level, plumb,
55 and on location lines as indicated.

1 **3.3 PREPARATION**

- 2 A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and
3 anchorages according to ASTM C 754 and metal composite material panel manufacturer's written
4 recommendations.

5 **3.4 METAL COMPOSITE MATERIAL PANEL INSTALLATION**

- 6 A. General: Install metal composite material panels according to manufacturer's written instructions in
7 orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless
8 otherwise indicated. Anchor metal composite material panels and other components of the Work securely
9 in place, with provisions for thermal and structural movement.

- 10 1. Shim or otherwise plumb substrates receiving metal composite material panels.
11 2. Flash and seal metal composite material panels at perimeter of all openings. Fasten with self-tapping
12 screws. Do not begin installation until air- or water-resistive barriers and flashings that will be
13 concealed by metal composite material panels are installed.
14 3. Install screw fasteners in predrilled holes.
15 4. Locate and space fastenings in uniform vertical and horizontal alignment.
16 5. Install flashing and trim as metal composite material panel work proceeds.
17 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end
18 laps to avoid a four-panel lap splice condition.
19 7. Align bottoms of metal composite material panels and fasten with blind rivets, bolts, or self-tapping
20 screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
21 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

- 22 B. Fasteners:

- 23 1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior;
24 use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

- 25 C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against
26 galvanic action as recommended in writing by metal composite material panel manufacturer.

- 27 D. Attachment Assembly, General: Install attachment assembly required to support metal composite material
28 wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions,
29 tracks, drainage channels, panel clips, and anchor channels.

- 30 1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and
31 panel-system joint seals.

- 32 E. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended by
33 manufacturer. Attach routed-and-returned flanges of wall panels to panel clips with manufacturer's standard
34 fasteners.

- 35 1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install
36 sealant backing and sealant according to requirements specified in Section 07 92 00 "Joint
37 Sealants."

- 38 F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting,
39 and provide for thermal expansion. Coordinate installation with flashings and other components.

- 40 1. Install components required for a complete metal composite material panel assembly including trim,
41 copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
42 Provide types indicated by metal composite material panel manufacturer; or, if not indicated, provide
43 types recommended in writing by metal composite material panel manufacturer.

- 44 G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions,
45 and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set
46 units true to line and level as indicated. Install work with laps, joints, and seams that are permanently
47 watertight.

- 48 1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and
49 levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim
50 to fit substrates and to result in waterproof performance.

- 51 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement
52 joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where
53 lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion
54 joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed
55 within joints).

56 **3.5 ERECTION TOLERANCES**

- 57 A. Installation Tolerances: Shim and align metal composite material wall panel units within installed tolerance
58 of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-
59 inchoffset of adjoining faces and of alignment of matching profiles.

- 1 **3.6 CLEANING AND PROTECTION**
2 A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are
3 installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of
4 metal composite material panel installation, clean finished surfaces as recommended by metal composite
5 material panel manufacturer. Maintain in a clean condition during construction.
6 B. After metal composite material panel installation, clear weep holes and drainage channels of obstructions,
7 dirt, and sealant.
8 C. Replace metal composite material panels that have been damaged or have deteriorated beyond successful
9 repair by finish touchup or similar minor repair procedures.

10

END OF SECTION 07 42 13.23

SECTION 07 53 23

ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof system application at plaza pavers on pedestals system on composite concrete/metal deck substrate.
 - 2. Roof system application at PV system and rack on metal deck substrate.
 - 3. Adhered ethylene-propylene-diene-monomer (EPDM) roofing system (**RFNG-1**).
 - 4. Cover board
 - 5. Roof insulation.
 - 6. Thermal barrier.
 - 7. Vapor Barrier.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
 - 3. Section 0776 00 "Pedestal Pavers" for pedestal supported pavers.

4. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
5. Section 22 14 23 "Storm Drainage Piping Specialties" for roof drains.
6. Section 26 31 00 "Photovoltaic System Performance Requirements" for PV racking system.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.
- B. Sheet Metal Terminology and Techniques: SMACNA Architectural Sheet Metal Manual.

1.4 SYSTEM DESCRIPTION (RFNG-1)

- A. Basis of Design: Roof system over steel structural deck is composed of two layers of Firestone ISO 95+ GL fully adhered insulation over thermal barrier installed as an air barrier, one layer of Firestone ISOGARD HD Coverboard, Firestone fully adhered 90-mil RubberGard Platinum EPDM and supporting PV panels on racking system anchored to membrane where scheduled. 30-year Firestone Platinum Warranty provided.
- B. Basis of Design: Roof system over composite steel/concrete structural deck is composed of two layers of Firestone ISO 95+ GL fully adhered insulation over vapor barrier, one layer of Firestone ISOGARD HD Coverboard, Firestone fully adhered 90-mil RubberGard Platinum EPDM and topped with plaza pavers supported on pedestals where scheduled. 30-year Firestone Platinum Warranty provided.

1.5 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 5. Review structural loading limitations of roof deck during and after roofing.
 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
 7. Review governing regulations and requirements for insurance and certificates if applicable.
 8. Review temporary protection requirements for roofing system during and after installation.
 9. Review roof observation and repair procedures after roofing installation.
- B. Preinstallation Roofing Conference: Conduct conference at Project site.
 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 5. Review structural loading limitations of roof deck during and after roofing.
 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
 7. Review governing regulations and requirements for insurance and certificates if applicable.
 8. Review temporary protection requirements for roofing system during and after installation.
 9. Review roof observation and repair procedures after roofing installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
- C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
 - 1. Base flashings and membrane terminations.
 - 2. Roof plan showing orientation of steel roof deck and orientation of roofing and fastening spacings and patterns for mechanically fastened roofing.
 - 3. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of complying with performance requirements.
- C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.
- E. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.
- F. Field quality-control reports.
- G. Sample Warranties: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

1.9 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.

1.10 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.

1.11 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.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, roofing accessories, and other components of roofing system.
 - 2. Warranty shall cover damage to roof membrane by installation of approved plaza deck and PV array components.
 - 3. Warranty Period: 30 years NDL from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain components including roof insulation fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Firestone Building Products or comparable product by one of the following:
 - 1. Carlisle Golden Seal Total Roofing System as manufactured by Carlisle Syntec Systems.
 - 2. Others as approved equals by Architect prior to Bid Solicitation.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
 - 1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
 - 2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Tested by a qualified testing agency to resist the following uplift pressures:
 - 1. Corner Uplift Pressure: 120 lbf/sq. ft.
 - 2. Perimeter Uplift Pressure: 90 lbf/sq. ft.
 - 3. Field-of-Roof Uplift Pressure: 60 lbf/sq. ft.
- D. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.
- E. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.3 EPDM ROOFING (RFNG-1)

- A. EPDM: ASTM D 4637, Type I, nonreinforced, uniform, flexible EPDM sheet.
 1. Thickness: 90 mils, nominal.
 2. Exposed Face Color: Black.

Physical Properties:	ASTM Standard	Units	Performance Minimum	Typical Values 90 mil
<i>Tensile Strength, minimum</i>	D 412 (Die C) D 826 (Modified)	Psi (MPa) Lbf/in (kN/m)	1305 (9.0) 51 (9)	1425 (9.8)
<i>Factory Seam Strength, minimum</i>	D 412 (Die C) D 624 (Die C)	---	Sheet Failure 300%	Sheet Failure 450%
<i>Elongation, minimum</i>	D 2240	%	150 (26.3)	200 (35.0)
<i>Tear Resistance, minimum</i>	D 1149	Lbf/in (kN/m)	65 ± 10	62
<i>Shore A Durometer</i>	---	---	No Cracks	No Cracks
<i>Ozone Resistance</i>	D 573			
<i>7 days/100 pphm @ 100 °F (37.8 °C) with 50% extension</i>	D 412 (Die C) D 412 (Die C) D 624 (Die C)	Psi (MPa) % Lbf/in (kN/m)	1205 (8.3) 200% 125 (21.9)	1415 (9.7) 290% 180 (31.5)
<i>Heat Aging</i>	D 1204	---	±1.0	<1.0
<i>28 days at 240 °F (116 °C) Tensile Strength Elongation</i>	D 2137	°F(°C) ±	-49 (-45) +8, -2	-63 (-53) +1.73
<i>Tear Resistance Linear Dimensional Change, maximum, %</i>	D 471	±	2.0	+1.93
<i>Brittleness Temperature</i>	E 96	±	±10	±10
<i>Water Resistance Change in Weight after Immersion 7 days @ 150 °F (65.6 °C), %</i>	D 412			

- B. Recycling:
1. Contractor shall divert all of the following materials from disposal at the landfill
 - a. Metals including edge metal, copings, counter flashings, expansion /control joint covers, and all non-contaminated metal pails.
 - b. Plastics, including packaging materials, pails, and containers
 - c. Cardboard, including packaging materials and roll cores
 - d. Wood, including demolished nailers, demolished plywood, demolished wood plank decking, damaged pallets, and new wood or plywood scrap and pieces
 2. Contractor shall package the debris as required by the recycler
 3. Contractor shall transport the debris to approved recyclers.
 4. Pallets in a condition to be reused shall not be land filled.
 5. Metal or plastic pails and containers that are contaminated with adhesive, mastic, coatings, and similar materials are excluded.

2.4 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
 - 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content:
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Single-Ply Roof Membrane Adhesives: 250 g/L.
 - c. Single-Ply Roof Membrane Sealants: 450 g/L.
 - d. Nonmembrane Roof Sealants: 300 g/L.
 - e. Sealant Primers for Nonporous Substrates: 250 g/L.
 - f. Sealant Primers for Porous Substrates: 775 g/L.
 - g. Other Adhesives and Sealants: 250 g/L.
- B. Sheet Flashing: 60-mil-thick EPDM, partially cured or cured, according to application.
- C. Protection Sheet: Epichlorohydrin or neoprene nonreinforced flexible sheet, 55- to 60-mil- thick, recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil.
- D. Bonding Adhesive: Manufacturer's standard, water based.
- E. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 5-inch-wide minimum, butyl splice tape with release film.
- F. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.
- G. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- H. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, pre-punched.
- I. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening membrane to substrate, and acceptable to roofing system manufacturer.
- J. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.
- K. PV Racking Roof Anchor:
 - 1. Product: U-Anchor 2000 Single Ply as manufactured by Anchor products:
 - 2. Description: An integrated solution for fully adhered single ply membrane applications, consisting of an encapsulated U-Anchor plate with a 3/8 inch-16 S.S. fused to a 16 inches X16 inches membrane target. The target is welded to a fully adhered roof membrane. The Target shall be made from the same brand as the roofing material. Provide color to match roof membrane.

2.5 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by EPDM roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Firestone Building Products Firestone Resista with fiberglass facer for fully adhered assembly or comparable product.
- C. Polyisocyanurate Cover Board: ASTM C 1289, Type II, Class 1, Grade 3.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Firestone Building Products ISOGARD HD or comparable product.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.6 SUBSTRATE BOARD (THERMAL BARRIER AT STEEL DECK)

- A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum board or ASTM C 1278/C 1278M, fiber-reinforced gypsum board.
 - 1. Thickness: 1/2 inch (13 mm).
 - 2. Surface Finish: Factory primed.
 - 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corporation; GlasRoc Sheathing Type X.
 - b. Georgia-Pacific Corporation; Dens Deck DuraGuard.
 - c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
 - d. USG Corporation; Securock Glass Mat Roof Board.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate panel to roof deck.
- C. Sealant and Flashing Tape: Installation accessories to provide a continuous plane of air/vapor barrier.
- D. Air Barrier Accessories: Tape, sealants and coated fabric to establish an air barrier at the top surface of the thermal barrier which is continuous with building AVB system.

2.7 VAPOR RETARDER (Concrete Deck)

- A. Membrane shall be a vapor barrier comprised of SBS modified bitumen adhesive, factory-laminated to a tri-laminate woven, high-density polyethylene top surface.
 - 1. V-Force Vapor Barrier Membrane as manufactured by Firestone Building Products.
 - 2. 725TR as manufactured by Carlisle SynTec Incorporated.
 - 3. DynaGrip SD/SA as manufactured by Johns Manville.

2.8 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation and cover board to another insulation layer as follows:
 - 1. Full-spread spray-applied, low-rise, two-component urethane adhesive.
- D. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.

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.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Steel Roof Deck:
 - 1. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053123 "Steel Roof Decking".
- D. Concrete Roof Decks:
 - 1. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
 - 2. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 3. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 ROOFING INSTALLATION, 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 the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 SUBSTRATE BOARD INSTALLATION (STEEL DECK)

- A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches (610 mm) 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 Global's "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.
 - 5. Continuously seal side and end joints with tape.
 - 6. Completely seal substrate boards at terminations, obstructions, and penetrations to prevent air and moisture vapor movement into roofing system.
- B. Air Barrier: Install thermal barrier with tape, sealants and coated fabric to establish an air barrier at the top surface for the thermal barrier continuous with building AVB system.

3.5 VAPOR-RETARDER INSTALLATION

- A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 inches and 6 inches, respectively. Seal laps by rolling.
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.
- C. Install vapor retarder continuous with building AVB

3.6 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together adhere to insulation.
 - 1. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.
 - 2. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3. Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.7 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing.
- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.
- E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeters.
- F. Apply roofing with side laps shingled with slope of roof deck where possible.
- G. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing terminations.
 1. Basis of Design: 3 inches QuickSeam™ Splice Tape and 5 inches QuickSeam Flashing OR 6 inches QuickSeam Splice Tape in side and end laps. QuickSeam Joint Covers are required at all joints and at angle changes 1:12 or greater.
- H. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- I. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal membrane roofing in place with clamping ring.

3.8 BASE FLASHING INSTALLATION

- 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 splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.
- F. PV Rack Anchor Installation:
 1. Prepare the roof surface by removing all loose debris and clean the area in accordance with the roofing manufacture recommendations
 2. Apply an approved Seam Slice Adhesive Primer to the roof membrane where the Double Sided Die Cut Adhesive will be placed and allow to dry before continuing.
 3. Peel back half of the release liner exposing the adhesive.
 4. Carefully align the Double Side Die Cut Adhesive and place into the desired position. Do not stretch or pull the adhesive.
 5. Apply an approved Seam Slice Adhesive Primer to the underside of the U-Anchor 2400 Single Ply cover and allow to dry before continuing.
 6. Remove the top release liner and place into position.
 7. Center and place the U-Anchor 2000 over the Double Sided Die Cut Adhesive avoiding wrinkles.
 8. Using a weighted membrane roller firmly roll the entire surface of the U-Anchor membrane cover to ensure a proper bond is achieved.
 9. Firmly roll the perimeter edge to embed the perimeter edge of the membrane in the adhesive. If you are unable to embed the edge of the membrane into the adhesive cut edge sealant may be needed to prevent the membrane reinforcement from wicking moisture.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

END OF SECTION 07 53 23

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

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24 **PART 1 - GENERAL**

25 **1.1 RELATED DOCUMENTS**

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

28 **1.2 SUMMARY**

- 29 A. Section Includes:
30 1. Formed wall sheet metal flashing fabrications.
31 2. Formed low slope roofing counter flashing fabrications.
32 3. Formed copings, roof edge drainage and reglets.
33 B. Related Work:
34 1. Section 04 22 00 - Concrete Unit Masonry.

35 **1.3 PREINSTALLATION MEETINGS**

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

37 **1.4 ACTION SUBMITTALS**

- 38 A. Product Data: For each type of product.
39 B. Sustainable Design Submittals:
40 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and
41 cost.
42 C. Shop Drawings: For sheet metal flashing and trim.
43 1. Include plans, elevations, sections, and attachment details.
44 2. Distinguish between shop- and field-assembled work.
45 3. Include identification of finish for each item.
46 4. Include pattern of seams and details of termination points, expansion joints and expansion-joint
47 covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.
48 D. Samples: For each exposed product and for each color and texture specified.
49

1 **1.5 INFORMATIONAL SUBMITTALS**

- 2 A. Product certificates.
3 B. Product test reports.
4 C. Sample warranty.

5 **1.6 CLOSEOUT SUBMITTALS**

- 6 A. Maintenance data.

7 **1.7 QUALITY ASSURANCE**

- 8 A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar
9 to that required for this Project and whose products have a record of successful in-service performance.

10 **1.8 WARRANTY**

- 11 A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim
12 that shows evidence of deterioration of factory-applied finishes within specified warranty period.
13 1. Finish Warranty Period: 20 years from date of Substantial Completion.

14 **PART 2 - PRODUCTS**

15 **2.1 PERFORMANCE REQUIREMENTS**

- 16 A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement,
17 thermally induced movement, and exposure to weather without failure due to defective manufacture,
18 fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not
19 rattle, leak, or loosen, and shall remain watertight.
20 B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual"
21 requirements for dimensions and profiles shown unless more stringent requirements are indicated.
22 C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less
23 than 25 percent.
24 D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
25 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

26 **2.2 SHEET METALS**

- 27 A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable,
28 temporary protective film before shipping.
29 B. Zinc-Tin Alloy-Coated Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead-soft, fully annealed,
30 stainless-steel sheet of minimum uncoated thickness indicated; coated on both sides with zinc-tin alloy (50
31 percent zinc, 50 percent tin), with factory-applied gray preweathering.
32 C. Copper Sheet (**SMF-1**): ASTM B 370, cold-rolled copper sheet, H00 or H01 temper.
33 1. Nonpatinated Exposed Finish: Mill.
34 2. Weight: 20 oz, UNO.
35 3. Gutters: Match existing profile. Provide where required to replace salvaged existing.
36 4. Downspouts: Formed Round, 5 inches diameter. Provide where required to replace salvaged
37 existing.
38 D. Aluminum Sheet (**SMF-2**): ASTM B 209, alloy as standard with manufacturer for finish required, with temper
39 as required to suit forming operations and performance required.
40 1. Alclad Finish: Metallurgically bonded surfacing alloy on both sides, forming aluminum sheet with
41 reflective luster.
42 2. Thickness: 0.040 inch, UNO.
43 3. Color: TBD, Match WDW-1 and MCP-1.
44 E. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to
45 ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to
46 ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to
47 comply with ASTM A 755/A 755M.
48 1. Exposed Coil-Coated Finish:
49 a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70
50 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed
51 metal surfaces to comply with coating and resin manufacturers' written instructions.
52 2. Color: As selected by Architect from manufacturer's full range.
53

- 1 F. Through Wall Flashing (**TWF**): Self-Adhered Through Wall Flashing Membrane with Stainless Steel Drip
2 Edge.
3 1. Through Wall Flashing Membrane: 3M 3015TWF.
4 2. Performance:
5 a. Colour: Black.
6 b. Thickness: 0.40 mm (15.5 mils).
7 c. Film Thickness: 0.19 mm (7.5 mils).
8 d. Application Temperature: -18°C to 66°C.
9 e. Elongation (ASTM D412 Die C): >600%.
10 f. Tensile Strength (ASTM D412 Die C): >7.0 MPa (>1000 psi).
11 g. Puncture Resistance Membrane (ASTM E154): >170 N (>38 lbf).
12 h. Nail Sealability (ASTM D1970, Section 7.9): Pass.
13 i. Water Vapour Permeance (ASTM E96 Method B): 0.05 Perms.
14 j. Air Permeance of Membrane @75 Pa (ASTM E2178) 0.0013 L/s.m2.
15 k. Lap Adhesion (ASTM D1876): >4.2 N/cm..
16 l. Low Temperature Flexibility@ -30°C Bend Test
17 m. (CGSB 37-GP-56M): Pass.
18 n. Moisture absorption (ASTM D570): <0.1%.
19 3. Stainless Steel Drip Edge:
20 a. Where flashing is partly exposed and is indicated to terminate at wall face, use flexible flashing
21 with a stainless steel drip edge.

22 **2.3 UNDERLAYMENT MATERIALS**

- 23 A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene-
24 or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with
25 release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing.
26 Provide primer according to written recommendations of underlayment manufacturer.
27 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
28 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
29 B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

30 **2.4 MISCELLANEOUS MATERIALS**

- 31 A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other
32 miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended
33 by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
34 B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other
35 suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet
36 metal.
37 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
38 a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied
39 coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed
40 fasteners bearing on weather side of metal.
41 b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being
42 fastened.
43 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
44 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
45 4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized
46 steel according to ASTM A 153/A 153M or ASTM F 2329.
47 C. Solder:
48 1. For base materials a mixture of tin and lead [with maximum lead content of 0.2 percent.
49 D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-
50 paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch
51 thick.
52 E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use
53 classifications required to seal joints in sheet metal flashing and trim and remain watertight.
54 F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by
55 aluminum manufacturer for exterior nonmoving joints, including riveted joints.
56 G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
57 H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

1 **2.5 FABRICATION, GENERAL**

- 2 A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations
3 in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other
4 characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
5 1. Obtain field measurements for accurate fit before shop fabrication.
6 2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool
7 marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
8 3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces
9 exposed to view.
10 B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
11 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl
12 sealant concealed within joints.
13 2. Use lapped expansion joints only where indicated on Drawings.
14 C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper
15 installation of elastomeric sealant according to cited sheet metal standard.
16 D. Fabricate cleats and attachment devices from same material as accessory being anchored or from
17 compatible, noncorrosive metal.
18 E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for
19 application, but not less than thickness of metal being secured.
20 F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

21 **PART 3 - EXECUTION**

22 **3.1 UNDERLAYMENT INSTALLATION**

- 23 A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical
24 fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of
25 not less than 2 inches.
26 B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate
27 if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment
28 manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle
29 fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap
30 side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

31 **3.2 INSTALLATION, GENERAL**

- 32 A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with
33 provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators,
34 sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
35 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with
36 minimum exposure of solder, welds, and sealant.
37 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify
38 shapes and dimensions of surfaces to be covered before fabricating sheet metal.
39 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs
40 over fasteners.
41 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool
42 marks.
43 5. Torch cutting of sheet metal flashing and trim is not permitted.
44 B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated
45 wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces
46 with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or
47 cited sheet metal standard.
48 1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with
49 bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
50 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood
51 substrates, install underlayment and cover with slip sheet.
52 C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints
53 at maximum of 10 feet with no joints within 24 inches of corner or intersection.
54 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant
55 concealed within joints.
56 2. Use lapped expansion joints only where indicated on Drawings.

- 1 D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails
- 2 and not less than 3/4 inch for wood screws.
- 3 E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize
- 4 possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- 5 F. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with
- 6 requirements in Section 07 92 00 "Joint Sealants."
- 7 G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets
- 8 with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in
- 9 completed Work.
- 10 1. Do not solder aluminum sheet.
- 11 2. Do not use torches for soldering.
- 12 3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove
- 13 flux and spatter from exposed surfaces.
- 14 4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid
- 15 flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder
- 16 manufacturer's recommended methods for cleaning and neutralization.
- 17 5. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.
- 18 H. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

19 **3.3 ROOF FLASHING INSTALLATION**

- 20 A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet
- 21 metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
- 22 Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- 23 B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for
- 24 elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band
- 25 and tighten.
- 26 C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert
- 27 counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over
- 28 base flashing. Lap counterflashing joints minimum of 4 inches.
- 29 D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and
- 30 other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

31 **3.4 WALL FLASHING INSTALLATION**

- 32 A. General: Install wall flashing to intercept and exclude penetrating moisture according to standard unless
- 33 otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such
- 34 as windows, doors, and louvers.
- 35 B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 04 22 00 "Concrete Unit
- 36 Masonry."

37 **3.5 CLEANING AND PROTECTION**

- 38 A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- 39 B. Clean and neutralize flux materials. Clean off excess solder.
- 40 C. Clean off excess sealants.
- 41 D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed
- 42 unless otherwise indicated in manufacturer's written installation instructions.

43 **END OF SECTION**

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SECTION 07 72 00

ROOF ACCESSORIES

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PART 2 – PRODUCTS

- [2.1 PERFORMANCE REQUIREMENTS](#)
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PART 3 – EXECUTION

- [3.1 EXAMINATION](#)
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- [3.3 REPAIR AND CLEANING](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof hatches.
- B. Related Sections:
 - 1. Section 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.

1.3 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

- A. 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.

1.5 WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's standard warranty. Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 ROOF HATCH

- A. Furnish and install where indicated on plans metal roof hatch Type S-50, size width: 36" (914mm) x length: 30" (762mm). Length denotes hinge side. The roof hatch shall be single leaf. The roof hatch shall be pre-assembled from the manufacturer.
- B. Performance characteristics:
 - 1. Cover shall be reinforced to support a minimum live load of 40 psf (195kg/m²) with a maximum deflection of 1/150th of the span and a 140 psf (684 kg/m²) wind uplift.
 - 2. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
 - 3. Operation of the cover shall not be affected by temperature.
 - 4. Entire hatch shall be weather tight with fully welded corner joints on cover and curb.
- C. Cover: Shall be 11 gauge (2.3mm) aluminum with a 3 inches (76mm) beaded flange with formed reinforcing members. Cover shall have a heavy extruded EPDM rubber gasket that is bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.
- D. Cover insulation: Shall be fiberglass of 1 inch (25mm) thickness, fully covered and protected by a metal liner 18 gauge (1mm) aluminum.
- E. Curb: Shall be 12 inches (305 mm) in height and of 11 gauge (2.3mm) aluminum. The curb shall be formed with a 3-1/2 inches (89mm) flange with 7/16 inch (11.1 mm) holes provided for securing to the roof deck. The curb shall be equipped with an integral metal cap flashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip® flashing system, including stamped tabs, 6 inches (153mm) on center, to be bent inward to hold single ply roofing membrane securely in place.
- F. Curb insulation: Shall be rigid, high-density fiberboard of 1 inch (25mm) thickness on outside of curb.
- G. Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe welded to the curb assembly.
- H. Hardware
 - 1. Heavy pintle hinges shall be provided
 - 2. Cover shall be equipped with a spring latch with interior and exterior turn handles
 - 3. Roof hatch shall be equipped with interior and exterior padlock hasps.
 - 4. The latch strike shall be a stamped component bolted to the curb assembly.
 - 5. Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1 inch (25mm) diameter red vinyl grip handle to permit easy release for closing.
 - 6. Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be zinc plated and chromate sealed.
 - 7. Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.
- I. Safety Post:
 - 1. Install on fixed ladder(s) below hatch cover(s), LadderUP® safety post Model LU-1 as manufactured by The BILCO Company. Designed with a telescoping tubular section that locks automatically when fully extended. Upward and downward movement shall be controlled by a stainless steel spring balancing mechanism. Unit shall be completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer's instructions.
- J. Finishes: Factory finish shall be mill finish aluminum.

2.3 METAL MATERIALS

- A. Aluminum Sheet: ASTM B 209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
 - 1. Mill Finish: As manufactured.
- B. Aluminum Extrusions and Tubes: ASTM B 221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.
- C. 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.

2.5 GENERAL FINISH REQUIREMENTS

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

- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by permanent separation tape as recommended by manufacturer.
- C. Roof-Hatch Installation:
 - 1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
- D. Seal joints with elastomeric sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.
- B. Clean off excess sealants.
- C. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 72 00

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SECTION 07 76 00

PEDESTAL PAVERS

PART 1 – GENERAL

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Adjustable roof deck pedestal.
 - 2. Concrete pavers.
- B. Related Requirements:
 - 1. Section 07 5323 "Ethylene-Propylene-Diene-Monomer (EDPM) Roofing".

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
- B. Confirm layout of heavy objects in the final design.
- C. Caution Owner to redesign paver supports when redesigning layout of heavy objects.

1.4 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
- B. Installation methods.
- C. Shop Drawings: Submit shop drawings detailing the installation methods. Coordinate placement with locations noted on the Contract Drawings.
- D. Samples: For each paver product and for each color and texture specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: Manufacturer's materials warranty.

1 **1.6 CLOSEOUT SUBMITTALS**

- 2 A. Maintenance Data: For pedestal system to include in maintenance manuals.
3 B. Attic Stock: Deliver 10 paver units to Owner.

4 **1.7 MAINTENANCE MATERIAL SUBMITTALS**

- 5 A. Furnish extra materials, from the same product run, that match products installed and that are packaged
6 with protective covering for storage and identified with labels describing contents.
7 1. Roof Pavers: 100 sq. ft. of each type, in unbroken bundles.
8 2. Pedestal and Accessory: Five.

9 **1.8 QUALITY ASSURANCE**

- 10 A. Manufacturer Qualifications:
11 1. All primary products specified in this section will be supplied by a single manufacturer with a minimum
12 of ten (10) years experience.
13 B. Installer Qualifications:
14 1. The deck support system installer shall have a minimum of two (2) years proven construction
15 experience, be capable of estimating and building from blueprint plans and details, determine
16 elevations, and properly handle materials. All Work shall comply with the Bison installation
17 application procedures for deck support work specified herein.
18 C. Special Considerations:
19 1. The contractor assumes the responsibility for and shall take into consideration the structural capability
20 and adequacy of the structure to carry the dead and live load weight(s) involved, and that the density
21 of any insulation is satisfactory to resist crushing and damaging the waterproofing membrane.

22 **1.9 DELIVERY, STORAGE, AND HANDLING**

- 23 A. Deliver and store deck supports and system components with labels intact and legible.
24 B. Inspect all delivered materials to insure they are undamaged and in good condition.

25 **1.10 FIELD CONDITIONS**

- 26 A. Deck supports specified shall be for used with pedestrian traffic only.
27 B. Perimeter Walls and Containment:
28 1. Pedestrian decks shall be restrained by perimeter blocking or walls on all sides. Lateral movement
29 greater than 1/8 inch is unacceptable and will be subject to rejection.
30 2. The deck surfacing tiles or pavers shall sit above the waterproofing integral flashing and or counter
31 flashing.
32 C. Heavy Roof Top Features. Flat bottom features such as planters, heavy benches, water features, hot tubs,
33 etc. shall require individual support that is in addition to the deck pedestal system.
34 1. A minimum of one additional pedestal support shall be installed for every 500 lbs. (or portion thereof)
35 of static loading. These additional support pedestals shall be installed directly under the decking
36 and evenly spaced immediately below the feature locations. One additional pedestal shall be
37 placed under corner of any rectangular feature.
38 a. Features supported by legs or feet are not advised or considered acceptable because of the
39 consequences of point loading.
40 b. Any feature that creates vibration shall be provided for in special consultation and written
41 agreement with manufacturer.
42 D. All decks shall be designed to not exceed the design capacity of the pedestal.
43 E. The substrate immediately below the pedestals shall provide positive drainage.
44 F. In the case of decks over roofing substrates, roof systems shall meet local building code and be in
45 accordance with the NRCA recommended good construction practices. Only roofing manufacturer
46 approved systems shall be used.
47

- 1 G. Decks over roofing and waterproofing:
2 1. Pedestals shall be installed on surfaces with a minimum 40 psi bearing capacity.
3 2. Roof Type: – Closed Cell Insulation Protecting Roof Membrane Systems.
4 a. Inverted Roof Membrane Systems that incorporate 40 + psi density closed cell extruded poly-
5 styrene insulation on top of the roofing membrane. The dense extruded polystyrene is
6 capable of bearing pedestal weights.
7 b. Bison pedestals can be installed directly on top of 40 psi, or greater, extruded closed cell
8 polystyrene insulation with 1.5 inches thickness or greater.
9 3. Roof Type: – Common Insulation installed below Roof Membranes.
10 a. Provide one of the following roof membrane protection techniques or as detailed on the
11 drawings.
12 1) Incorporate one of the thin Cap Bearing Protective Layer Insulation specifications that
13 call for a very thin protective layer to be installed on top of the common 20 psi
14 insulation. Such a cap type insulation product is commonly formed as a thin dense
15 low-foamed isocyanurate layer, and provides the necessary pedestal support.
16 2) Bison Model FIB Pedestal Base: Install an enlarged base that supports the pedestal
17 to distribute the anticipated loaded weight of a pedestal over an enlarged area. Bison
18 manufacturers the Floating Insulation Base (Model FIB) for this purpose. Model FIB
19 is specifically designed to be directly installed over Type 1 roof systems that
20 incorporate 20 psi common insulation boards.
21 3) Insulation above the Membrane: Install a 1.5" thick (min.) layer of dense, closed cell 40
22 psi (min.) extruded cell poly-styrene insulation board above the common roofing
23 system that has buried insulation to provide support for the pedestal system.

24 **1.11 WARRANTY**

- 25 A. The manufacturer and installer warrants that the Work will remain free from defects of labor and materials
26 used in conjunction with the work in accordance with the General Conditions for this project or a minimum
27 of three (3) years.

28 **PART 2 - PRODUCTS**

29 **2.1 PAVERS**

- 30 A. Concrete (**PVR-1**): Westile, an Oldcastle Company, Paver, 24 inches x 24 inches x 2 inches. As selected by
31 Architect.
32 1. Comparable product by Bison.
33 B. Wood (**PVR-2**): Bison Wood Slat Paver, 24 inches x 24 inches x 1.69 inches. As selected by Architect.
34 1. Class A (Meets and exceeds ASTM E108-07a Class A Spread of Flame Test).
35 2. 2 feet x 2 feet FSC® 100% Cumaru Wood Tile – Smooth.

36 **2.2 APPLICATIONS/SCOPE**

- 37 A. Furnish and install a complete adjustable deck support system.
38 1. Maximum cavity height 12 inches (305 mm) without additional bracing.
39 B. Deck supports are not designed for supporting decks that carry vehicular traffic or equipment including but
40 not limited to snow removal equipment, ATV's, forklifts, or any motorized vehicles.
41 C. Pedestal Support Manufacturer: Bison Innovative Products.

42 **2.3 DECK PEDESTALS**

- 43 A. System: Versadjust by Bison
44 1. Height Range 2-1/4 to 24 inches.
45 2. Weight Bearing Design Capacity 1250 lbs/pedestal FS:3.
46 3. Made in the USA
47 B. Adjustable Pedestals:
48 1. Model: V1 – 18: 2¼" – 2¾" (57mm – 70mm) with 1/8 inch tab
49 2. Model: V1 – 316: 2¼" – 2¾" (57mm – 70mm) with 3/16 inch tab
50 3. Model: V2 - 18: 2¾" - 3¾" (70mm – 95mm) with 1/8 inch tab
51 4. Model: V2 – 316: 2¾" - 3¾" (70mm – 95mm) with 3/16 inch tab
52 5. Model: V3 – 18: 3¾" - 5¾" (95mm – 146mm) with 1/8 inch tab
53 6. Model: V3 – 316: 3¾" - 5¾" (95mm – 146mm) with 3/16 inch tab
54 7. Model: V4 – 18: 5¾" - 9" (146mm – 229mm) with 1/8 inch tab
55 8. Model: V4 – 316: 5¾" - 9" (146mm – 229mm) with 3/16 inch tab

- 1 9. Model: VC2 - Coupler adds between 0" to 4" inches (0mm-102mm)
- 2 10. Model: V4 + VC2 9 inches to 13 inches (229mm – 330mm).
- 3 11. Model: V4 + VC2 + VC2: 13 inches to 17 inches (330mm - 432mm)
- 4 12. Model: V4 + VC2 + VC2 + VC2: 17 inches to 21 inches (432mm - 533mm)
- 5 13. Model: V4 + VC2 + VC2 + VC2 + VC2: 21 inches to MAXIMUM HEIGHT 24 inches (533mm - 610mm)
- 6 14. If over 24" use Couplers in conjunction with Bison Brace system. Base Model: Includes 2 adjusting
7 base leveler disks
 - 8 a. Diameter: 8" inches (203 mm) diameter x 3/16 inch (4.75mm) top wall thickness.
 - 9 b. Bearing Surface Area: 50.24 square inches (1276 sq. mm)
 - 10 c. Six (6) - 1/4 inch (6mm) diameter holes for drainage and / or mechanical attachment.
 - 11 d. Top Unit: 5/32" inch (4mm) thick plate with a 42.39" square inch (736.6 sq. mm.) bearing
12 surface area.
 - 13 e. Spacer Tabs uniform spacing between pavers:
 - 14 f. VT18 1/8 inch (3.175 mm) tab thickness.
 - 15 g. VT316 3/16 inch (4.5mm) tab thickness.
 - 16 h. Load Capacity: Maximum 1250 lbs (567 kg) per pedestal with a Safety Factor of 3 (FS:3).
 - 17 i. Material: Mineral Filled High Density Copolymer Polypropylene.
 - 18 1) Contains 20% Post-industrial recycled material.
- 19 C. Base Leveler Disks:
 - 20 1. Model: LD4 - Placed beneath pedestals to compensate for slopes up to 1 inch per foot.
 - 21 a. Slope: 1/4 inch per foot each. Two additional LD4 units may be added.
 - 22 b. V Series Pedestals include two (2) Model VB Integral Base Leveler Disks.
 - 23 c. All other pedestals may stack up to four LD4's under one pedestal for up to 1 inch of slope
24 compensation.
 - 25 d. Dimensions: Center point thickness 3/8 inch (9.5mm).
 - 26 e. Material: Mineral Filled High Density Copolymer Polypropylene.
 - 27 f. Contains 20% Post-industrial recycled material.
- 28 D. Shims:
 - 29 1. Model: B11 Flexible Shim 1/16 inch
 - 30 a. Use no more than 4 shims. If using only 1/4 segment, adhere it to the pedestal with
31 construction adhesive.
 - 32 b. Material: 1.5 mm Sanaprene.
 - 33 2. Model: PS1 Rigid Poly Shims 1/8 inch (3.175mm)
 - 34 a. Use no more than 2 shims. If using only 1/4 segment, adhere it to the pedestal with
35 construction adhesive.
 - 36 b. Material: Mineral Filled High Density Copolymer Polypropylene.
 - 37 c. Contains 20% Post-industrial recycled material
 - 38 3. Model: BB-Wedge
 - 39 a. Spacing Wedge
 - 40 b. Material: Mineral Filled High Density Copolymer Polypropylene.
 - 41 c. Contains 20% Post-industrial recycled material.

42 PART 3 - EXECUTION

43 3.1 EXAMINATION

- 44 A. Do not begin installation until substrates have been properly prepared.
- 45 B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation
46 before proceeding.
- 47 C. Verify all elevations, required pedestal heights and deck dimensions before commencing work.

48 3.2 PREPARATION

- 49 A. Establish accurate lines, levels and visual pattern.
- 50 B. The substrate surface that will receive the deck supports shall be structurally capable of carrying the dead
51 and live loads anticipated.
- 52 C. The substrate shall be clean and free of projections and debris that could impair the performance of the
53 deck system.

54 3.3 INSTALLATION

- 55 A. Install in accordance with Bison and other contributing manufacturer's instructions.
- 56 B. Place a slip sheet material identical to the roofing membrane in the location on the grid of each pedestal.

- 1 C. If required, place a Floating Insulation Base (FIB) board or Floating Foundation Base (FFB) in the location on
2 the grid of each pedestal.
- 3 D. Next, a deck support shall be placed where each measured grid line meets the perimeter. Remove two (2)
4 spacer tabs in line with one another on top of each deck support placed around the perimeter. Remove all
5 four (4) spacer tabs at corners.
- 6 E. Adjust each deck support to a “top of pedestal” elevation marked around the perimeter. Normally the deck
7 support is positioned as close to the perimeter as possible, with the two remaining spacer tabs aligned with
8 the grid line. Using the “top of pedestal” elevation marked on the perimeter, stretch a mason’s line along
9 and slightly ahead of the second row of deck supports. A laser leveling device may also be used for this
10 purpose.
- 11 F. On larger decks, it is recommended that pedestals be pre-sorted and pre-set to the proper elevation and
12 placed in position prior to the installation of pavers or tiles.
- 13 G. As the deck supports located along the grid lines are loaded with pavers or tiles, fine vertical adjustment can
14 be made by rotating the base or bottom of the deck support. Clockwise rotation of the pedestal base will
15 raise the bearing surface and the deck. Counter-clockwise rotation will lower the top bearing surface.
- 16 H. Bison pedestals have built in height limit indicator ‘bumps’. When pedestal is fully extended, height limit
17 indicator “bumps” will be felt and heard, indicating the maximum height of the pedestal. Do not extend
18 pedestal beyond the height limit indicators. Do not exceed maximum height listed on pedestal, use the next
19 size pedestal. A C4 coupler shall be added to the B4 model to achieve greater heights. Always maintain
20 adequate thread engagement. Never over extend any pedestal.
- 21 I. Slight irregularities in decking panel thickness can be compensated for by using one to two shim segments.
22 Place on top of the pedestal, under the corner(s) of the decking tile or paver. Use no more than two (2)
23 shims on top of the pedestal and always adhere quartered (1/4) wedges with construction adhesive.
- 24 J. Stackable Fixed Height Pedestals: Complete deck and grid layout as instructed above. Stack no more than
25 four (4) fixed height pedestals together and place in lieu of adjustable pedestals where needed. Spacer
26 tabs can be removed to accommodate perimeter and corner support locations.
- 27 K. V Series Slope Compensation:
- 28 1. The V Series has integrated base leveler disks that compensate for up to ½ inch per foot slope.
29 Additional slope compensation can be added by placing two additional LD4 disks under the pedestal
30 base to compensate for up to 1 inch per foot of slope.
- 31 2. Place the thickest edge of the disk (located on the edge by a small finger tab) at the down slope side
32 of the deck support, one disk compensates for 1/4 inch per foot of slope. Using two to four disks,
33 rotate one in relation to the other to create a level deck support.
- 34 3. Shims may be used in multiples, whole or segmented, and placed under the base to level the deck
35 support.
- 36 4. Under a pedestal: All shims under a pedestal must be adhered to each other or the pedestal (NOT
37 to the roofing membrane) with construction adhesive. Shim no more than 1/8 inch (3mm) beneath
38 each pedestal.
- 39 5. On top of a pedestal: Use no more than 2 shims.
- 40 6. Versadjust Series Pedestal Bracing with Bison Brace
- 41 7. Excess Height: Required for added Stability for Installations 24”-36” in height
- 42 8. For Installations requiring additional stability.
- 43 9. One level of Bison Brace Collars must be installed at the mid-point height of the pedestal column.
44 Once the standard height is established (i.e. 18” for 36” overall height) that same level of Collar
45 placement must be maintained. NOTE: Final adjustment for top of deck height must be made prior
46 to setting the standard height for the Brace Collars.
- 47 10. BB–S: Short Bison Brace: Install around the outside perimeter of a walk deck where pedestals are
48 installed where less than the typical 24” spacing occurs and shorter arms are required.
- 49 11. BB–L: Long Bison Brace: Install in the interior area of a walk deck where pedestals and 23 - 7/8” x
50 23 – 7/8” surfacing panels are installed providing uniform 24” spacing.
- 51 12. Install Bison Braces by placing the two-hole brace ends over the self-locking pegs on Collar or base,
52 fit brace arms together making sure all brace teeth are firmly interlocked and secure with Screw and
53 Wing Nut. Braces should be installed as tightly as possible to create a rigid bracing system between
54 each vertical pedestal column.
- 55 13. Two Bison Brace arms extend outward from each corner pedestal in perpendicular rows. This results
56 in a series of braces attached to Collars (BB – C) in each horizontal direction from one side of the
57 deck to the other and from one end to the other.
- 58 14. Once the horizontal perpendicular run(s) of Bison Braces are properly installed at the correct height(s),
59 the deck surfacing panels may be installed as the decking system progresses.

- 1 **3.4 DECK SUPPORT PLACEMENT AND FINAL ADJUSTMENT**
- 2 A. Deck supports and the deck surface panels shall be placed as the manufacturer directs in these written
- 3 instructions.
- 4 B. Pedestals are designed to be rotated for final slight adjustment when pedestals are fully loaded. Deck
- 5 supports should be leveled in each succeeding row as the installation proceeds. Final height adjustment or
- 6 maintenance is easily made by simply rotating the Screwjack support in a clockwise or counter-clockwise
- 7 direction to raise or lower the deck surface material.
- 8 C. Additional sections of shims may be used and should be available for regular maintenance. Shims may be
- 9 used in multiples, whole or segmented, and placed under the base or on top the pedestal to level the deck
- 10 support.
- 11 D. On top of pedestal: Use construction adhesive to adhere sections of shims. Construction adhesive is not
- 12 required when using whole shims on top of a pedestal.
- 13 E. Beneath a pedestal: Use a small amount of construction adhesive to adhere sections of shims and/or whole
- 14 shims to each other or to the pedestal. Unless specified to do so, DO NOT use construction adhesive to
- 15 adhere pedestal or shims to insulation, roofing or waterproofing membrane.
- 16 **3.5 PERIMETER CONTAINMENT**
- 17 A. Any area of a deck that is not restrained by a parapet or foundation wall shall be 'boxed-in' and contained.
- 18 The deck panels will move if all sides are not adequately restrained. Perimeter framing and edging boards
- 19 located at the outside of the deck perimeter shall be installed to provide restraint. No movement should be
- 20 allowed at the perimeter of the deck system greater than 1/8 inch.
- 21 **3.6 FIELD QUALITY CONTROL**
- 22 A. Inspect often during installation to assure that grid spacer lines are being maintained in a straight and
- 23 consistent pattern and that deck panels or pavers are level and not rocking.
- 24 B. Confirm that deck pedestal height does not exceed the specified height of 16 inches (406.4mm).
- 25 C. Unless otherwise specified in writing to allow for expansion, inspect to assure that all paver spacing between
- 26 tiles and at perimeter containment does not exceed a 1/8 inch. Particular attention should be made to assure
- 27 that all pedestrian entry or access points to the deck are level and that the deck surface tiles are not randomly
- 28 raised or uneven creating a tripping or safety hazard.
- 29 **3.7 PROTECTION**
- 30 A. Protect installed products until completion of project.
- 31 B. Touch-up, repair or replace damaged products before Substantial Completion.
- 32 **3.8 IMMEDIATELY FOLLOWING INSTALLATION**
- 33 A. The Owner, or the Owner's Agent, shall carefully inspect the deck system to be positive that:
- 34 1. The new deck system is adequately blocked on all sides to contain the surface decking and related
- 35 components.
- 36 2. There is no more than 1/8 inch spacing between any deck panels and at all sides of the deck
- 37 perimeter.
- 38 3. There is no ballasting rock used to fill in any perimeter voids.
- 39 4. There is no 'rocking' of deck panels as foot traffic is applied to the surface decking.
- 40 5. All required spacer tabs are in place and visible.
- 41

- 1 **3.9 ROUTINE MAINTENANCE AND CARE**
2 A. Installer and/or Architect has a duty to instruct the deck owner about performing routine maintenance of the
3 deck. Check for rocking pavers and adjust or shim immediately. Pedestals can settle and may have to be
4 realigned. Failure to do so can cause a tripping hazard. Periodically check spacer tabs and immediately
5 replace broken tabs to limit deck movement. Make sure the edge restraint stays intact and structurally
6 sound.
7 B. Contractor shall return to the Project nine months following Substantial Completion and inspect and adjust
8 pavers and pedestals.

9 **END OF SECTION**

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SECTION 07 84 13
PENETRATION FIRESTOPPING

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22 **PART 1 - GENERAL**

23 **1.1 RELATED DOCUMENTS**

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

26 **1.2 SUMMARY**

- 27 A. Section Includes:
28 1. Penetrations in fire-resistance-rated walls (FB-1).
29 2. Penetrations in horizontal assemblies (FB-2).

30 **1.3 PREINSTALLATION MEETINGS**

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

32 **1.4 ACTION SUBMITTALS**

- 33 A. Product Data: For each type of product.
34 B. Sustainable Design Submittals:
35 1. Product Data: For sealants, indicating VOC content.
36 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting
37 materials.
38 C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping
39 system, and design designation of qualified testing and inspecting agency.
40 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and
41 inspecting agency's illustration for a particular penetration firestopping system, submit illustration,
42 with modifications marked, approved by penetration firestopping system manufacturer's fire-
43 protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
44 Obtain approval of authorities having jurisdiction prior to submittal.

45 **1.5 INFORMATIONAL SUBMITTALS**

- 46 A. Qualification Data: For Installer.
47 B. Product test reports.

48 **1.6 CLOSEOUT SUBMITTALS**

- 49 A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in
50 compliance with requirements and manufacturer's written instructions.

- 1 **1.7 QUALITY ASSURANCE**
- 2 A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991,
3 "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified
4 Firestop Contractor Program Requirements."
- 5 B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
6 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities
7 having jurisdiction.
8 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration
9 Firestopping" Article. Provide rated systems complying with the following requirements:
10 a. Penetration firestopping products bear classification marking of qualified testing and
11 inspecting agency.
12 b. Classification markings on penetration firestopping correspond to designations listed by the
13 following:
14 1) UL in its "Fire Resistance Directory."
15 C. Preinstallation Conference: Conduct conference at Project site.
- 16 **1.8 PROJECT CONDITIONS**
- 17 A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures
18 are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because
19 of rain, frost, condensation, or other causes.
20 B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of
21 ventilations or, where this is inadequate, forced-air circulation.
- 22 **1.9 COORDINATION**
- 23 A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is
24 installed according to specified requirements.
25 B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration
26 firestopping.

27 **PART 2 - PRODUCTS**

- 28 **2.1 PERFORMANCE REQUIREMENTS**
- 29 A. Fire-Test-Response Characteristics:
30 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to
31 authorities having jurisdiction.
32 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated
33 systems complying with the following requirements:
34 a. Penetration firestopping systems shall bear classification marking of a qualified testing
35 agency.
36 1) UL in its "Fire Resistance Directory."
37 2) Intertek Group in its "Directory of Listed Building Products."
38 3) FM Global in its "Building Materials Approval Guide."
- 39 **2.2 PENETRATION FIRESTOPPING SYSTEMS**
- 40 A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases,
41 and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems
42 shall be compatible with one another, with the substrates forming openings, and with penetrating items if
43 any.
44 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products
45 that may be incorporated into the Work include, but are not limited to the following:
46 a. 3M Fire Protection Products:
47 b. Hilti, Inc.
48 c. Tremco, Inc.
49 B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per
50 ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
51 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
52

- 1 C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per
2 ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
3 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
4 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated
5 except for floor penetrations within the cavity of a wall.
6 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when
7 tested according to UL 1479.
8 D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479,
9 based on testing at a positive pressure differential of 0.30-inch wg.
10 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm
11 cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
12 E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25
13 and 450, respectively, per ASTM E 84.
14 1. Sealant shall have a VOC content of 250 g/L or less.
15 F. Accessories: Provide components for each penetration firestopping system that are needed to install fill
16 materials and to maintain ratings required. Use only those components specified by penetration
17 firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions
18 indicated.

19 2.3 TELECOMMUNICATIONS AND ELECTRICAL APPLICATIONS

- 20 A. Cable Bundling Protection:
21 1. Composite Sheet (Intumescent): The intumescent sheet shall be capable of passing ASTM E 814
22 (ANSI/UL 1479) Standard Method of Fire Tests for Through-Penetration Fire Stops up to the
23 desired fire resistance rating.
24 2. Basis of Design: 3M CS-195+ Composite Sheet.
25 3. Systems Components:
26 a. Fire barrier caulk or putty.
27 b. Fire barrier wrap strip.
28 c. Graphite intumescent seal.
29 d. Sheet metal, anchors, washers and screws.
30 e. Cardboard.
31 4. Single Cable Tray - Wall (One and Two Hour Wall): Based on W-L-40004.
32 5. Single and Multiple Cable Trays – Concrete Floor (One and Two Hours): Based on C-AJ-4003.
33 6. Single Cable Tray – Concrete Curb Retrofit (One and Two Hours): Based on F-B-3004.

34 2.4 FILL MATERIALS

- 35 A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and
36 consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to
37 one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
38 B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to
39 moisture.
40 C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent
41 material sized to fit specific diameter of penetrant.
42 D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded
43 to galvanized-steel sheet.
44 E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic
45 fibers, or silicone compounds.
46 F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one
47 side.
48 G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and
49 lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking,
50 homogeneous mortar.
51 H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a
52 combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where
53 exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily
54 removed.
55 I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in
56 place to produce a flexible, nonshrinking foam.
57

- 1 J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade
2 indicated below:
3 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces,
4 and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping
5 limits use of nonsag grade for both opening conditions.

6 **PART 3 - EXECUTION**

7 **3.1 INSTALLATION**

- 8 A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening
9 configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
10 B. General: Install penetration firestopping systems to comply with manufacturer's written installation
11 instructions and published drawings for products and applications.
12 C. Install forming materials and other accessories of types required to support fill materials during their
13 application and in the position needed to produce cross-sectional shapes and depths required to achieve
14 fire ratings.
15 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials
16 and other accessories not forming permanent components of firestopping.
17 D. Install fill materials by proven techniques to produce the following results:
18 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to
19 achieve required fire-resistance ratings.
20 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating
21 items.
22 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth,
23 uniform surfaces that are flush with adjoining finishes.

24 **3.2 IDENTIFICATION**

- 25 A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words
26 "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches
27 high and with minimum 0.375-inch strokes.
28 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at
29 intervals not exceeding 30 feet.
30 B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels.
31 Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system
32 edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use
33 mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to
34 surfaces on which labels are placed. Include the following information on labels:
35 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of
36 Any Damage."
37 2. Contractor's name, address, and phone number.
38 3. Designation of applicable testing and inspecting agency.
39 4. Date of installation.
40 5. Manufacturer's name.
41 6. Installer's name.

42 **3.3 FIELD QUALITY CONTROL**

- 43 A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
44 B. Where deficiencies are found or penetration firestopping system is damaged or removed because of
45 testing, repair or replace penetration firestopping system to comply with requirements.
46 C. Proceed with enclosing penetration firestopping systems with other construction only after inspection
47 reports are issued and installations comply with requirements.

48 **END OF SECTION**

SECTION 07 92 00
JOINT SEALANTS

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25 **PART 1 - GENERAL**

26 **1.1 RELATED DOCUMENTS**

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

29 **1.2 SUMMARY**

- 30 A. Section Includes:
- 31 1. Silicone joint sealants.
 - 32 2. Nonstaining silicone joint sealants.
 - 33 3. Mildew-resistant joint sealants.
 - 34 4. Latex joint sealants.

35 **1.3 PREINSTALLATION MEETINGS**

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

37 **1.4 ACTION SUBMITTALS**

- 38 A. Product Data: For each joint-sealant product.
- 39 B. Sustainable Design Submittals:
- 40 1. Product Data: For sealants, indicating VOC content.
 - 41 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting
42 materials.
- 43 C. Samples: For each kind and color of joint sealant required.
- 44 D. Joint-Sealant Schedule: Include the following information:
- 45 1. Joint-sealant application, joint location, and designation.
 - 46 2. Joint-sealant manufacturer and product name.
 - 47 3. Joint-sealant formulation.
 - 48 4. Joint-sealant color.
- 49

1 **1.5 INFORMATIONAL SUBMITTALS**

- 2 A. Product test reports.
- 3 B. Preconstruction laboratory test reports.
- 4 C. Preconstruction field-adhesion-test reports.
- 5 D. Field-adhesion-test reports.
- 6 E. Sample warranties.

7 **1.6 QUALITY ASSURANCE**

- 8 A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

9 **1.7 PRECONSTRUCTION TESTING**

- 10 A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below,
11 samples of materials that will contact or affect joint sealants.
 - 12 1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint
13 preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint
14 substrates.
 - 15 2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with
16 glazing and gasket materials.
 - 17 3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with stone
18 and masonry substrates.
- 19 B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint
20 substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in
21 Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

22 **1.8 WARRANTY**

- 23 A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with
24 performance and other requirements specified in this Section within specified warranty period.
 - 25 1. Warranty Period: Two years from date of Substantial Completion.
- 26 B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those
27 joint sealants that do not comply with performance and other requirements specified in this Section within
28 specified warranty period.
 - 29 1. Warranty Period: **Five** years from date of Substantial Completion.

30 **PART 2 - PRODUCTS**

31 **2.1 JOINT SEALANTS, GENERAL**

- 32 A. VOC Content: Sealants and sealant primers shall comply with the following:
 - 33 1. Architectural sealants shall have a VOC content of 250 g/L or less.
 - 34 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
 - 35 3. Sealants and sealant primers for porous substrates shall have a VOC content of 775 g/L or less.
- 36 B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

37 **2.2 NONSTAINING SILICONE JOINT SEALANTS**

- 38 A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
- 39 B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50
40 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S,
41 Grade NS, Class 50, Use NT.
 - 42 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products
43 that may be incorporated into the Work include, but are not limited to the following:
 - 44 a. Dow Corning Corporation.
 - 45 b. Pecora Corporation.
 - 46 c. Sika Corporation; Joint Sealants.
 - 47 d. Tremco Incorporated.

48

- 1 **2.3 URETHANE JOINT SEALANTS**
- 2 A. Urethane, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement
- 3 capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25,
- 4 Uses T and NT.
- 5 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products
- 6 that may be incorporated into the Work include, but are not limited to the following:
- 7 a. BASF Corporation; Construction Systems.
- 8 b. LymTal International Inc.
- 9 **2.4 IMMERSIBLE JOINT SEALANTS**
- 10 A. Immersible Joint Sealants. Suitable for immersion in liquids; ASTM C 1247, **Class 1**; tested in deionized
- 11 water unless otherwise indicated
- 12 B. Urethane, Immersible, S, P, 50, T, NT, I: Immersible, single-component, pourable, plus 50 percent and
- 13 minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920,
- 14 Type S, Grade P, Class 25, Uses T, NT, and I.
- 15 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products
- 16 that may be incorporated into the Work include, but are not limited to the following:
- 17 a. Sika Corporation; Joint Sealants.
- 18 b. Tremco Incorporated.
- 19 c. W. R. Meadows, Inc.
- 20 **2.5 MILDEW-RESISTANT JOINT SEALANTS**
- 21 A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent
- 22 mold and mildew growth.
- 23 B. Silicone, Mildew Resistant, Acid Curing, S, NS, 50, NT: Mildew-resistant, single-component, nonsag, plus 50
- 24 percent and minus 50 percent movement capability, nontraffic-use, acid-curing silicone joint sealant;
- 25 ASTM C 920, Type S, Grade NS, Class 25, Use NT.
- 26 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products
- 27 that may be incorporated into the Work include, but are not limited to the following:
- 28 a. Dow Corning Corporation.
- 29 b. GE Construction Sealants; Momentive Performance Materials Inc.
- 30 c. Tremco Incorporated.
- 31 C. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
- 32 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products
- 33 that may be incorporated into the Work include, but are not limited to the following:
- 34 a. BASF Corporation; Construction Systems.
- 35 b. Pecora Corporation.
- 36 c. Tremco Incorporated.
- 37 **2.6 JOINT-SEALANT BACKING**
- 38 A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size
- 39 and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- 40 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products
- 41 that may be incorporated into the Work include, but are not limited to the following:
- 42 a. Alcot Plastics Ltd.
- 43 b. BASF Corporation; Construction Systems.
- 44 c. Construction Foam Products; a division of Nomaco, Inc.
- 45 B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.
- 46 C. Preformed Expanding Foam Sealant: Backerseal (Greyflex) by Emseal.
- 47 1. Secondary Seal and Backer for Sealant: Size and application as indicated.
- 48 **2.7 MISCELLANEOUS MATERIALS**
- 49 A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint
- 50 substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- 51 B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant
- 52 backing materials.
- 53 C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to
- 54 joints.

1 **PART 3 - EXECUTION**

2 **3.1 PREPARATION**

- 3 A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-
4 sealant manufacturer's written instructions and the following requirements:
- 5 1. Remove laitance and form-release agents from concrete.
 - 6 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain,
7 harm substrates, or leave residues capable of interfering with adhesion.
- 8 B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by
9 preconstruction joint-sealant-substrate tests or prior experience.
- 10 C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining
11 surfaces.

12 **3.2 INSTALLATION OF JOINT SEALANTS**

- 13 A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for
14 products and applications indicated, unless more stringent requirements apply.
- 15 B. Install sealant backings of kind indicated to support sealants during application and at position required to
16 produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum
17 sealant movement capability.
- 18 C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs
19 of joints.
- 20 D. Preformed Expanding Foam Sealant:
- 21 1. For installation behind liquid-sealant and backer-rod:
 - 22 a. Set backerseal sufficiently deep into joint to allow for installation of properly sized backer-rod
23 set at its appropriate depth.
 - 24 2. For installation behind directly-applied sealant:
 - 25 a. Set backerseal back from the face of the joint to maintain effective joint geometry of 1 to 2.
 - 26 b. Before applying primary wet sealant, ensure that backerseal is firmly expanded in the joint.
 - 27 c. Primary sealant shall be well tooled against backerseal.
- 28 E. Install sealants using proven techniques that comply with the following and at the same time backings are
29 installed:
- 30 1. Place sealants so they directly contact and fully wet joint substrates.
 - 31 2. Completely fill recesses in each joint configuration.
 - 32 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum
33 sealant movement capability.
- 34 F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool
35 sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in
36 writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- 37 1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

38 **3.3 FIELD QUALITY CONTROL**

- 39 A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
- 40 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - 41 a. Perform 5 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
 - 42 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab,
43 in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 44 B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or
45 noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail
46 to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications
47 until test results prove sealants comply with indicated requirements.
- 48

- 1 **3.4 JOINT-SEALANT SCHEDULE**
- 2 A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
- 3 1. Joint Locations:
- 4 a. Isolation and contraction joints in cast-in-place concrete slabs.
- 5 b. Joints in stone paving units, including steps.
- 6 c. Tile control and expansion joints.
- 7 d. Joints between different materials listed above.
- 8 e. Other joints as indicated on Drawings.
- 9 2. Joint Sealant: Urethane, M, P, 50, T, NT.
- 10 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- 11 B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion .
- 12 1. Joint Locations:
- 13 a. Joints in pedestrian plazas.
- 14 b. Other joints as indicated on Drawings.
- 15 2. Joint Sealant: Urethane, immersible, S, P, 50, T, NT, I.
- 16 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- 17 C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
- 18 1. Joint Locations:
- 19 a. Construction joints in cast-in-place concrete.
- 20 b. Joints between plant-precast architectural concrete units.
- 21 c. Control and expansion joints in unit masonry.
- 22 d. Joints in dimension stone cladding.
- 23 e. Joints between stone or masonry exterior envelope components/assemblies and window and
- 24 door frames and/or subframes.
- 25 f. Other joints as indicated on Drawings.
- 26 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
- 27 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors
- 28 D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces .
- 29 1. Joint Locations:
- 30 a. Isolation joints in cast-in-place concrete slabs.
- 31 b. Control and expansion joints in stone flooring.
- 32 c. Control and expansion joints in brick flooring.
- 33 d. Control and expansion joints in tile flooring.
- 34 e. Other joints as indicated on Drawings.
- 35 2. Joint Sealant: Urethane, S, P, 50, T, NT.
- 36 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- 37 E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
- 38 1. Joint Locations:
- 39 a. Control and expansion joints on exposed interior surfaces of exterior walls.
- 40 b. Tile control and expansion joints.
- 41 c. Vertical joints on exposed surfaces of unit masonry walls and partitions.
- 42 d. Joints on underside of plant-precast structural concrete
- 43 e. Other joints as indicated on Drawings.
- 44 2. Joint Sealant: Urethane, S, NS, 50, NT.
- 45 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- 46 F. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to
- 47 significant movement .
- 48 1. Joint Locations:
- 49 a. Control joints on exposed interior surfaces of exterior walls.
- 50 b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and
- 51 elevator entrances.
- 52 c. Other joints as indicated on Drawings.
- 53 2. Joint Sealant: Acrylic latex.
- 54 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- 55

- 1 G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic
2 surfaces .
3 1. Joint Locations:
4 a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
5 b. Tile control and expansion joints where indicated.
6 c. Other joints as indicated on Drawings.
7 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 50, NT.
8 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

9

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

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25 **PART 1 - GENERAL**

26 **1.1 RELATED DOCUMENTS**

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

29 **1.2 SUMMARY**

- 30 A. Section includes hollow-metal work.
31 B. Related Sections:
32 1. Section 08 34 73.13 "Metal Sound Control Door Assemblies".

33 **1.3 DEFINITIONS**

- 34 A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803
35 or SDI A250.8.

36 **1.4 COORDINATION**

- 37 A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and
38 directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with
39 integral anchors. Deliver such items to Project site in time for installation.
40 B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control
41 and security systems.

42 **1.5 PREINSTALLATION MEETINGS**

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

44 **1.6 ACTION SUBMITTALS**

- 45 A. Product Data: For each type of product.
46 B. Sustainable Design Submittals:
47 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content
48 and cost.

- 1 C. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for
- 2 hardware, and other details.
- 3 D. Samples for Initial Selection: For units with factory-applied color finishes.
- 4 E. Samples for Verification: For each type of exposed finish required.
- 5 F. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and
- 6 openings as those on Drawings.

7 **1.7 INFORMATIONAL SUBMITTALS**

- 8 A. Product test reports.

9 **PART 2 - PRODUCTS**

10 **2.1 MANUFACTURERS**

- 11 A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that
- 12 may be incorporated into the Work include, but are not limited to the following:
- 13 1. Amweld Building Products, LLC
- 14 2. Curries Company; ASSA ABLOY.
- 15 3. LaForce, Inc.
- 16 4. Steelcraft; an Allegion brand

17 **2.2 REGULATORY REQUIREMENTS**

- 18 A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency
- 19 acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated,
- 20 based on testing at positive pressure according to NFPA 252 or UL 10C.
- 21 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for
- 22 smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction,
- 23 based on testing according to UL 1784 and installed in compliance with NFPA 105.
- 24 B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and
- 25 inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based
- 26 on testing according to NFPA 257 or UL 9.

27 **2.3 INTERIOR DOORS AND FRAMES**

- 28 A. Standard-Duty Doors and Frames: SDI A250.8, Level 1. At locations indicated in the Door and Frame
- 29 Schedule.
- 30 1. Physical Performance: Level C according to SDI A250.4.
- 31 2. Doors:
- 32 a. Type: As indicated in the Door and Frame Schedule.
- 33 b. Thickness: 1-3/4 inches.
- 34 c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.032 inch.
- 35 d. Edge Construction: Model 1, Full Flush.
- 36 e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane,
- 37 polyisocyanurate, mineral-board, or vertical steel-stiffener core.
- 38 1) Fire Door Core: As required to provide fire-protection and temperature-rise ratings
- 39 indicated.
- 40 2) Acoustic Rated Door: As required to provide acoustic ratings indicated.
- 41 3. Frames:
- 42 a. Materials: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
- 43 b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door
- 44 frame.
- 45 c. Construction: Full profile welded.
- 46 4. Exposed Finish: Factory Prime, field painted PT-3_.
- 47

- 1 B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2. At locations indicated in the Door and Frame
2 Schedule.
3 1. Physical Performance: Level B according to SDI A250.4.
4 2. Doors:
5 a. Type: As indicated in the Door and Frame Schedule.
6 b. Thickness: 1-3/4 inches.
7 c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
8 d. Edge Construction: Model 1, Full Flush.
9 e. Core: Manufacturer's standard Kraft-paper honeycomb, Polystyrene, Polyurethane,
10 Polyisocyanurate, Mineral board or Vertical steel stiffener.
11 3. Frames:
12 a. Materials: Uncoated, steel sheet, minimum thickness of 0.053 inch.
13 b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door
14 frame.
15 c. Construction: Full profile welded.
16 4. Exposed Finish: Factory **Prime, field painted.**

17 **2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES**

- 18 A. Heavy-Duty Doors and Frames (DR-3): SDI A250.8, Level 2. At locations indicated in the Door and Frame
19 Schedule.
20 1. Physical Performance: Level B according to SDI A250.4.
21 2. Doors:
22 a. Type: As indicated in the Door and Frame Schedule.
23 b. Thickness: 1-3/4 inches.
24 c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch, with minimum A40
25 coating.
26 d. Edge Construction: Model 1, Full Flush.
27 e. Core: Manufacturer's standard insulation material: Polystyrene, Polyurethane or
28 Polyisocyanurate.
29 3. Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less
30 than 6.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
31 4. Frames:
32 a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40
33 coating.
34 b. Construction: Full profile welded.
35 5. Exposed Finish: Factory Prime, field painted PT-7.

36 **2.5 BORROWED LITES**

- 37 A. Hollow-metal frames of **uncoated** steel sheet, minimum thickness of **0.053 inch**.
38 B. Construction: Full profile welded.

39 **2.6 FRAME ANCHORS**

- 40 A. Jamb Anchors:
41 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than
42 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long;
43 or wire anchors not less than 0.177 inch thick.
44 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
45 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
46 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts
47 with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement
48 plate, welded to frame at each anchor location.
49 B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
50 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
51 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less
52 than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

53 **2.7 MATERIALS**

- 54 A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer
55 recycled content not less than **25 percent**.
56 B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed
57 applications.

- 1 C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or
- 2 surface defects; pickled and oiled.
- 3 D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- 4 E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill
- 5 phosphatized.
- 6 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or
- 7 ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- 8 F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- 9 G. Power-Actuated Fasteners in Concrete: From corrosion-resistant materials.
- 10 H. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to
- 11 ASTM C 143/C 143M.
- 12 I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing).
- 13 J. Glazing: Section 08 80 00 "Glazing."
- 14 K. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat.

15 2.8 FABRICATION

- 16 A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to
- 17 required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble
- 18 units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot
- 19 be permanently factory assembled before shipment.
- 20 B. Hollow-Metal Doors:
- 21 1. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to
- 22 escape. Seal joints in top edges of doors against water penetration.
- 23 2. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80
- 24 for fire-performance rating or where indicated.
- 25 C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations,
- 26 provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
- 27 1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or
- 28 joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by
- 29 butt welding.
- 30 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless
- 31 otherwise indicated.
- 32 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
- 33 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor;
- 34 however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
- 35 5. Jamb Anchors: Provide number and spacing of anchors as follows:
- 36 a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame.
- 37 Space anchors not more than 32 inches o.c., to match coursing, and as follows:
- 38 1) Two anchors per jamb up to 60 inches high.
- 39 2) Three anchors per jamb from 60 to 90 inches high.
- 40 3) Four anchors per jamb from 90 to 120 inches high.
- 41 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or
- 42 fraction thereof above 120 inches high.
- 43 b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame.
- 44 Space anchors not more than 32 inches o.c. and as follows:
- 45 1) Three anchors per jamb up to 60 inches high.
- 46 2) Four anchors per jamb from 60 to 90 inches high.
- 47 3) Five anchors per jamb from 90 to 96 inches high.
- 48 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or
- 49 fraction thereof above 96 inches high.
- 50 c. Compression Type: Not less than two anchors in each frame.
- 51 d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom
- 52 of frame. Space anchors not more than 26 inches o.c.
- 53 6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers.
- 54 a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
- 55 b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- 56 D. Removable Center Mullions: Interior frames scheduled for pairs of doors shall be provided with removable
- 57 center mullion. Refer to Section 08 71 00 – Door Hardware for door frame and door hardware preparation
- 58 required.
- 59

- 1 E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware;
2 include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door
3 Hardware Schedule, and templates.
4 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door
5 hardware.
6 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-
7 metal work for hardware.
8 F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form
9 corners of stops and moldings with mitered hairline joints.
10 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
11 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is
12 capable of being removed independently.
13 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and
14 frames.
15 4. Provide loose stops and moldings on inside of hollow-metal work.
16 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types
17 indicated.

18 **2.9 STEEL FINISHES**

- 19 A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
20 1. Shop Primer: SDI A250.10.
21 B. Factory Finish: SDI A250.3.
22 1. Color and Gloss: As selected by Architect from manufacturer's full range.

23 **2.10 ACCESSORIES**

- 24 A. Louvers: Provide sightproof louvers for interior doors, where indicated, which comply with SDI 111C, with
25 blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
26 1. Fire-Rated Automatic Louvers: Movable blades closed by actuating fusible link, and listed and
27 labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated.
28 B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
29 C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

30 **PART 3 - EXECUTION**

31 **3.1 INSTALLATION**

- 32 A. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other
33 openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by
34 standards specified.
35 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors
36 are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and
37 undamaged.
38 a. At fire-rated openings, install frames according to NFPA 80.
39 b. Where frames are fabricated in sections because of shipping or handling limitations, field
40 splice at approved locations by welding face joint continuously; grind, fill, dress, and make
41 splice smooth, flush, and invisible on exposed faces.
42 c. Install frames with removable stops located on secure side of opening.
43 d. Install door silencers in frames before grouting.
44 e. Remove temporary braces necessary for installation only after frames have been properly
45 set and secured.
46 f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to
47 comply with installation tolerances.
48 g. Field apply bituminous coating to backs of frames that will be filled with grout containing
49 antifreezing agents.
50 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure
51 with postinstalled expansion anchors.
52 a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion
53 anchors if so indicated and approved on Shop Drawings.
54 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
55 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames
56 and masonry with grout.

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5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- B. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- C. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

28 **3.2 ADJUSTING AND CLEANING**

- 29 A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection.
- 30 Leave work in complete and proper operating condition. Remove and replace defective work, including
- 31 hollow-metal work that is warped, bowed, or otherwise unacceptable.
- 32 B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- 33 C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and
- 34 apply touchup of compatible air-drying, rust-inhibitive primer.
- 35 D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according
- 36 to manufacturer's written instructions.
- 37 E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting
- 38 Sections.
- 39

END OF SECTION

SECTION 08 31 13
ACCESS DOORS AND FRAMES.

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2
3 PART 1 – GENERAL
4 1.1 RELATED DOCUMENTS
5 1.2 SUMMARY
6 1.3 ACTION SUBMITTALS
7 PART 2 – PRODUCTS
8 2.1 PERFORMANCE REQUIREMENTS
9 2.2 ACCESS DOORS AND FRAMES
10 2.3 FIRE-RATED ACCESS DOORS AND FRAMES
11 2.4 MATERIALS
12 2.5 FABRICATION
13 2.6 FINISHES
14 PART 3 – EXECUTION
15 3.1 INSTALLATION

16 PART 1 - GENERAL

17 1.1 RELATED DOCUMENTS

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

20 1.2 SUMMARY

- 21 A. Section includes access doors and frames for walls and ceilings **(AXP)**.

22 1.3 ACTION SUBMITTALS

- 23 A. Product Data: For each type of product.
24 B. Samples: For each type of access door and frame and for each finish specified.
25 C. Product Schedule: For access doors and frames use same designations indicated on Drawings.

26 PART 2 - PRODUCTS

27 2.1 PERFORMANCE REQUIREMENTS

- 28 A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by
29 a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

30 2.2 ACCESS DOORS AND FRAMES

- 31 A. Flush Access Doors with Exposed Flanges **(AXP)**:
32 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products
33 that may be incorporated into the Work include, but are not limited to the following:
34 a. Acudor Products, Inc.
35 b. Babcock-Davis.
36 c. JL Industries, Inc.; a division of the Activar Construction Products Group.
37 d. Larsens Manufacturing Company.
38 e. MIFAB, Inc.
39 f. Milcor; Commercial Products Group of Hart & Cooley, Inc.
40 g. Nystrom, Inc.
41 2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
42 3. Locations: Wall and ceiling.
43 4. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage, factory primed.
44 5. Latch and Lock: Cam latch, screwdriver operated.

45 2.3 FIRE-RATED ACCESS DOORS AND FRAMES

- 46 A. Fire-Rated, Flush Access Doors with Exposed Flanges **(AXP)**:
47 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products
48 that may be incorporated into the Work include, but are not limited to the following:
49 a. Acudor Products, Inc.

- 1 b. Babcock-Davis.
- 2 c. JL Industries, Inc.; a division of the Activar Construction Products Group.
- 3 d. Larsens Manufacturing Company.
- 4 e. MIFAB, Inc.
- 5 f. Milcor; Commercial Products Group of Hart & Cooley, Inc.
- 6 g. Nystrom, Inc.
- 7 2. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet
- 8 metal; with exposed flange, self-closing door, and concealed hinge.
- 9 3. Locations: Wall and ceiling.
- 10 4. Fire-Resistance Rating: Not less than that of adjacent construction.
- 11 5. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage, factory primed.
- 12 6. Latch and Lock: Self-latching door hardware, prepared for mortise cylinder.

13 **2.4 MATERIALS**

- 14 A. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet
- 15 substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- 16 B. Frame Anchors: Same material as door face.
- 17 C. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or
- 18 ASTM F 2329.

19 **2.5 FABRICATION**

- 20 A. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with
- 21 smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller
- 22 marks, rolled trade names, or roughness.
- 23 B. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting
- 24 holes, attachment devices and fasteners of type required to secure access doors to types of supports
- 25 indicated.
- 26 C. Latch and Lock Hardware:
- 27 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
- 28 2. Keys: Furnish two keys per lock and key all locks alike.
- 29 3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in
- 30 Section 08 71 00 "Door Hardware."

31 **2.6 FINISHES**

- 32 A. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating,
- 33 and applying and baking finish.
- 34 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer
- 35 immediately after surface preparation and pretreatment.

36 **PART 3 - EXECUTION**

37 **3.1 INSTALLATION**

- 38 A. Comply with manufacturer's written instructions for installing access doors and frames.
- 39 B. Adjust doors and hardware, after installation, for proper operation.

40 **END OF SECTION**

**SECTION 08 44 10
FIRE RATED ALUMINUM CURTAIN WALL**

PART 1 – GENERAL

- [1.1 RELATED DOCUMENTS](#)
- [1.2 SECTION INCLUDES](#)
- [1.3 RELATED SECTIONS](#)
- [1.4 PREINSTALLATION MEETINGS](#)
- [1.5 REFERENCES](#)
- [1.6 SYSTEM DESCRIPTION](#)
- [1.7 SUBMITTALS](#)
- [1.8 QUALITY ASSURANCE](#)
- [1.9 DELIVERY, STORAGE AND HANDLING](#)
- [1.10 PROJECT CONDITIONS](#)

PART 2 – PRODUCTS

- [2.1 FIRE-RATED ALUMINUM FIXED WINDOWS \(\):](#)
- [2.2 MATERIALS – ALUMINUM FRAMING](#)
- [2.3 MATERIALS – FIRE RESISTANT GLAZING](#)
- [2.4 MATERIALS – GLAZING AND ASSEMBLY ACCESSORIES](#)
- [2.5 FABRICATION](#)
- [2.6 FINISHES](#)

PART 3 – EXECUTION

- [3.1 EXAMINATION](#)
- [3.2 INSTALLATION](#)
- [3.3 CLEANING](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

- A. Fire-rated aluminum curtain wall forming door frame only (no glazing).
- B. Fire-rated aluminum full vision door system including pre-finished door, frame, glazing, and hardware.

1.3 RELATED SECTIONS

- A. Section 08 88 13: Fire-Resistant Glazing.

1.4 PREINSTALLATION MEETINGS

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

1.5 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 2. ASTM E2010 Standard Test Method for Positive Pressure Fire Tests of Window Assemblies.
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 80: Standard for Fire Doors and Fire Windows.
 - 2. NFPA 251: Standard Methods of Tests of Fire Endurance of Building Construction and Materials.
 - 3. NFPA 252: Standard Methods of Fire Tests of Door Assemblies.
 - 4. NFPA 257: Standard on Fire Test for Window and Glass Block Assemblies.
- C. Uniform Building Code (UBC):
 - 1. UBC-7-4: Methods for Fire Tests of Window Assemblies.
 - 2. UBC-7-2: Methods for Fire Tests of Door Assemblies.
 - 3. UL 10C: Positive Pressure Fire Tests of Door Assemblies.
- D. Underwriters Laboratories, Inc. (UL):
 - 1. UL 9: Fire Tests of Window Assemblies.
 - 2. UL 263: Fire Tests of Building Construction and Materials
- E. American National Standards Institute (ANSI):
 - 1. ANSI Z97.1 Safety Glazing Materials Used in Buildings – Safety Performance Specifications and

Methods of Test.

- F. Consumer Product Safety Commission (CPSC):
 - 1. CPSC 16 CFR 1201 Categories I and II: Safety Standard for Glazing Materials.

1.6 SYSTEM DESCRIPTION

- A. Performance Requirements – Curtain Wall:
 - 1. Fire Rating: 120 minutes.
 - 2. Certification: Windows shall be tested in accordance with ASTM E 2010, NFPA 252, UBC 7-4, UL263, CAN4-S106.
 - 3. Testing Laboratory: Fire tests shall have been conducted by an approved independent testing laboratory, similar to Underwriter's Laboratories, Inc.
- B. Performance Requirements – Doors:
 - 1. Fire Rating: 90 minutes.
 - 2. Certification: Doors and frames shall be tested in accordance with ASTM E 2074, NFPA 252, UBC 7-2, UL 10C, CAN4-S104.
 - 3. Testing Laboratory: Fire tests shall have been conducted by an approved independent testing laboratory, similar to Underwriter's Laboratories, Inc.

1.7 SUBMITTALS

- A. Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedure Section.
 - 1. Shop Drawings: Submit shop drawings showing layouts, profiles and product components.
 - 2. Samples: Submit samples for finishes, colors and textures.
 - 3. Technical Information: Submit latest edition of manufacturer's product data providing product description, technical data and installation instructions.

1.8 QUALITY ASSURANCE

- A. Listings and Labels:
 - 1. Fire rated framing and glazing shall be under current follow-up services by an approved independent agency and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.
- B. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a mockup submittal for review.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- B. Delivery: Deliver materials to specified destination in manufacturer's packaging undamaged, complete with installation instructions.
- C. Storage and Protection: Store off ground, under cover, protected from weather, direct sunlight, construction activities and at temperature conditions recommended by manufacturer, +10°F to +110°F.
- D. Handling: Protect materials and finish during handling and installation to prevent damage.

1.10 PROJECT CONDITIONS

- A. Field Measurements: Verify actual measurements for openings by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

PART 2 - PRODUCTS

2.1 FIRE-RATED ALUMINUM FIXED WINDOWS, DOORS AND FRAMES (FRDR-1):

- A. Basis of Design: Aluflam North America:
- B. Alternate: SaffiFirst Temperature Rise Builder Series Door Leafs.
 - 1. GPX Wall with 120 Min fire resistive rating.
 - 2. GPX door pair with 90 Min fire resistive rating.
 - 3. Glass: Vetrotech Saint-Gobain: Contraflam 90 and Contraflam 120 glazing.
 - 4. Alternate glass: SaffiFirst SuperLite II-XL.

2.2 MATERIALS – ALUMINUM FRAMING

- A. Frame construction: Integral structure, pressure plate, and cap from extruded aluminum profiles. Filled internally with cement composite material.
- B. Dimensions (Basis of design dimensions only; other system dimensions may vary within 1/4 inch of the sightline width/framing face dimension indicated):
 - 1. Curtain Wall:
 - a. Perimeter framing face dimension: 2-3/8 inch
 - b. Depth of vertical framing: 6-1/4 inch
 - c. Depth of horizontal framing: 6-1/8 inch.
 - 2. Door and Frame:
 - a. Door framing face dimension: 2-1/2 inches
 - b. Depth of door framing: 3-5/8 for 90 Min Door
 - c. Door stile face dimension: 3-3/4 for 90 Min Door
 - d. Door cross rail: N/A for 90 Min Door.
- C. Assembly:
 - 1. Window frame corners assembled with mechanical fasteners – in factory or in the field.
 - 2. Door frame corners assembled by means of crimped and bonded miter joints.
- D. Sealing: Framing system shall insulate against effects of fire, smoke, and heat transfer from either side. Perimeter of the framing system to the rough opening shall be firmly packed with mineral wool insulation.

2.3 MATERIALS – FIRE RESISTANT GLAZING

- A. Wall assemblies shall be glazed with 120 minute rated 1-9/16 inches thick SGG Contraflam 120-N2 fire resistant glazing material as manufactured by Vetrotech Saint-Gobain
- B. Door assemblies shall be glazed with 90 minute rated 1-3/8 inches thick SGG Contraflam 90 fire resistant glazing material as manufactured by Vetrotech Saint-Gobain
- C. Individual lites shall be permanently identified with a listing mark.
- D. Glazing material installed in "Hazardous Locations" (subject to human impact) shall be certified to meet the applicable requirements for fire rated assemblies referenced in ANSI Z97.1 Standard for Safety Glazing Materials Used In Buildings and/or CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.
- E. Visible daylight transmission shall be a minimum of 70% for window glazing and 81 % for door glazing. Glazing material shall be optically clear, colorless and free from unusual distortion.

2.4 MATERIALS – GLAZING AND ASSEMBLY ACCESSORIES

- A. Fasteners: All fasteners, setting pads, and glazing clips, shall be stainless or zinc-plated steel.
- B. Glazing Accessories: The glazing material perimeter shall be separated from the perimeter framing system with approved flame retardant intumescent glazing tape. Ceramic setting blocks shall be placed between the metal setting pads and the glazing material. Setting pads and blocks provided by manufacturer.

2.5 FABRICATION

- A. Curtainwall frames shall be furnished pre-assembled or K-D. Curtainwall assemblies shall be field glazed.
- B. Door frames and door leaves shall be furnished pre-assembled. Door assemblies shall be field glazed.
- C. Fabrication Dimensions: Fabricate to approved dimensions. The general contractor shall guarantee dimensions within required tolerance (+ - 1/8"). Obtain approved shop drawings prior to fabrication.

2.6 FINISHES

- A. Framing shall be chemically cleaned and pretreated, then finished on all exposed areas with:
 - 1. Fluoropolymer Paint – Kynar/Duranar. 2 coat 70% fluoropolymer coatings. Color to match Kawneer Permardize Hardcoat Dark Bronze #40.
- B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Slight variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

2.7 DOOR HARDWARE

- A. Hardware shall be supplied from door manufacturer's standard recommended hardware groups as specified.
- B. Operating hardware for active/active pairs of doors. Each to have the following:
- | | | | | |
|---|----|----------------------------|--|---------|
| 8 | EA | BUTT HINGES | 5BB1 | IVE |
| 2 | EA | POWER TRANSFER | EPT10 | VON |
| 2 | EA | ELEC FIRE EXIT
HARDWARE | RX-QEL+-3347A-EO-F | VON |
| 1 | EA | INTERCHANGEABLE
CORE | CYLINDER AS REQUIRED | SCH |
| 1 | EA | REMOVEABLE MULLION | | VON |
| 1 | EA | SMOKE SEALS | 188S | ZER |
| 2 | EA | KICK PLATE | 8400 48" X 42" LDW B4E CS | IVE |
| 2 | EA | TRIM | EXISTING 9"x42" OAK PULLS | EXTG |
| 1 | EA | SURF. AUTO OPERATOR | Magic-Force | Stanley |
| 2 | EA | ACTUATOR, WALL MOUNT | 8310-813
(Touchless) | LCN |
| 1 | EA | WIRING DIAGRAMS | RISER & POINT-TO-POINT (BY HARDWARE
SUPPLIER) | |
| 1 | EA | POWER SUPPLY | PS902 900-4R FA900 | SCE |
- C. FUNCTION: (DT) Latchbolt retracted inside by exit device push pad. Access from Lobby side when exit device push pad is dogged down. Loss of power or activation of fire alarm will release push pad, and ensure fire door is latched

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine area to receive curtainwall. Openings shall be plumb, square and within allowable tolerances. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Curtainwall installation shall be by a specialty contractor with appropriate experience qualifications; and in strict accordance with the approved shop drawings.

3.3 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Glass and frame should be cleaned using soft clean cloth, chamois leathers, sponges or soft paper. Use clean warm water with a mild detergent. Do not use detergent that contains either alkaline, acids or fluoride! Abrasive cleaning methods can damage surfaces! Clean prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

1 **SECTION 08 52 00 - ALUMINUM / WOOD COMPOSITE WINDOW WALLS**

2 PART 1 – GENERAL

- 3 1.1 [RELATED DOCUMENTS](#)
- 4 1.2 [SUMMARY](#)
- 5 1.3 [RELATED SECTIONS](#)
- 6 1.4 [PREINSTALLATION MEETINGS](#)
- 7 1.5 [SYSTEM PERFORMANCE](#)
- 8 1.6 [ACTION SUBMITTALS](#)
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- 11 1.9 [DELIVERY, STORAGE, AND HANDLING](#)
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13 PART 2 – PRODUCTS

- 14 2.1 [ACCEPTABLE MANUFACTURERS](#)
- 15 2.2 [MATERIALS](#)
- 16 2.3 [WINDOWS \(WDW-1\)](#)
- 17 2.4 [OUTSWING PATIO DOORS](#)
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19 PART 3 – EXECUTION

- 20 3.1 [EXAMINATION](#)
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- 24 3.5 [PROTECTION](#)

25 **PART 1 - GENERAL**

26 **1.1 RELATED DOCUMENTS**

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

29 **1.2 SUMMARY**

- 30 A. Section includes:
 - 31 1. Aluminum-composite wood window walls **(WDW-1)**.
 - 32 2. Aluminum-composite wood swing doors.
 - 33 3. Aluminum-composite wood awning windows.

34 **1.3 RELATED SECTIONS**

- 35 A. Section 061053-miscellaneous Rough Carpentry: Wood perimeter shims and blocking.
- 36 B. Section 079200-Joint Sealants: Perimeter sealant and backer materials.
- 37 C. Section 088000-Glazing.

38 **1.4 PREINSTALLATION MEETINGS**

- 39 A. Preinstallation Conference: Conduct conference at Project site.
 - 40 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel,
 - 41 equipment, and facilities needed to make progress and avoid delays.
 - 42 2. Review, discuss, and coordinate the interrelationship of wood windows with other exterior wall
 - 43 components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and
 - 44 protecting finishes.
 - 45 3. Review and discuss the sequence of work required to construct a watertight and weathertight
 - 46 exterior building envelope.
 - 47 4. Inspect and discuss the condition of substrate and other preparatory work performed by other
 - 48 trades.

49 **1.5 SYSTEM PERFORMANCE**

- 50 A. General: Provide aluminum/wood composite window units that meet or exceed performance requirements
- 51 specified:

- 1 1. AAMA/WDMA 101/I.S. 2-97 Section 2.2.9 Fixed Windows and Section 2.2.4 Projected Windows.
2 Rating shall be: AP-AW70 or F-AW70.
- 3 B. Design Requirements: Comply with structural performance, air infiltration, and water penetration
4 requirements indicated in AAMA/WDMA 101/I.S. 2-97 for type, grade, and performance class of window
5 units required.
- 6 C. Testing: Test each type and size of required window unit through a recognized Independent Testing
7 Laboratory or Agency, in accordance with ASTM E283 for air infiltration, and with ASTM E331 for water
8 penetration.
 - 9 1. Air Infiltration: Exterior windows will not exceed 0.10 CFM per lineal foot of sash crack when tested
10 in accordance with ASTM E 283-99 at a uniform pressure of 6.24 PSF.
 - 11 2. Water Resistance: No water leakage will occur when windows are tested in accordance with ASTM
12 E 331-00 at a static pressure of 10.00 PSF.
 - 13 3. Uniform Load Deflection Test: No glass breakage, permanent damage to fasteners, hardware
14 parts, or damage to make window inoperable or deflection of any unsupported span (meeting rails,
15 muntins, frames, mullions, or other appurtenances) in excess of L/175 at both a positive and a
16 negative load in minimum of 70 PSF when tested in accordance with ASTM E330-97.
 - 17 4. Uniform Structural Load: Unit is to be tested at 1.5 times design wind pressure, both positive and
18 negative at 105 PSF in accordance with ASTM E 330-97. There shall be no glass breakage,
19 permanent damage to fasteners, hardware parts or any other damage to make the window
20 inoperable.
 - 21 5. There shall be no permanent deformation of any main frame or sash member in excess of 2% of its
22 span.

23 1.6 ACTION SUBMITTALS

- 24 A. Product Data: For each type of product.
 - 25 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of
26 individual components and profiles, hardware, and finishes for wood windows.
- 27 B. LEED Submittals:
 - 28 1. Certificates for Credit MR 7: Chain-of-custody certificates indicating that windows comply with
29 forest certification and chain-of-custody requirements. Include statement indicating cost for each
30 certified wood product.
- 31 C. Shop drawings: Submit drawings and product data under provisions of Section 01 30 0. Include
32 dimensions, relationships to construction of adjacent work, air and vapor barrier seal to adjacent
33 construction, component anchorage, type of caulking, window locations, installation methods and
34 installation materials.
- 35 D. Samples for Verification: For wood windows and components required, prepared on Samples of size
36 indicated below:
 - 37 1. Exposed Finishes: 2 by 4 inches.
 - 38 2. Exposed Hardware: Full-size units.
- 39 E. Product Schedule: For wood windows. Use same designations indicated on Drawings.

40 1.7 INFORMATIONAL SUBMITTALS

- 41 A. Qualification Data: For manufacturer and Installer.
- 42 B. Test Reports: Provide certification by a recognized Independent Testing Laboratory showing that each
43 type, grade, and size of window unit complies with performance requirements for air infiltration, water
44 resistance and uniform structural loads.
- 45 C. Field quality-control reports.
- 46 D. Sample Warranties: For manufacturer's warranties.

47 1.8 QUALITY ASSURANCE

- 48 A. Manufacturer Qualifications: A manufacturer capable of fabricating wood windows that meet or exceed
49 performance requirements indicated and of documenting this performance by test reports, and calculations
50 and who is certified for chain of custody by an FSC-accredited certification body.
- 51 B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification
52 body.
- 53 C. Installer Qualifications: An installer acceptable to wood window manufacturer for installation of units
54 required for this Project.
- 55 D. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a
56 mockup submittal for review.
- 57 E. Mock-up: Full height window wall section with assemblies incorporated to reflect full feature of design
58 anticipated.

- 1 1. Junction of new wood clad window system **WDW-1** with existing brick masonry wall at the existing
- 2 lobby east elevation. Size to be based on Level 1 window opening height and width at the east
- 3 elevation, as an in-place mockup to be reviewed prior to completing the work.
- 4 2. New wood clad fixed and operable window **WDW-1** at level 1 classroom including window sill and
- 5 jamb and head finishes.
- 6 3. Incorporate a WDW-1 unit into both of the wall mockups. One for stone/CMU/air barrier and
- 7 another for MP-1/ACM-1/Stud Wall/Air Barrier.
- 8 F. Pre-installation Window Test: The owner reserves the right to randomly select one window at the time of
- 9 delivery and submit it to an Independent Laboratory for testing. Testing will verify compliance of the
- 10 production run with these specifications. The cost for pre-installation testing shall be paid by the Owner.
- 11 Any deficiencies discovered on the window by the testing, and deficiencies in any similar models used in
- 12 the project, will be corrected by the Bidder at no cost to the Owner.
- 13 G. Post Installation Field-Testing: Shall be in accordance with AAMA 502-90 using test method A.
- 14 1. After installation and before final payment, up to 2%, but not less than 2 windows shall be tested for
- 15 air infiltration and water infiltration as specified. Windows will be randomly selected by the Owner
- 16 on the day of testing.
- 17 2. Conduct air infiltration tests at a uniform static pressure of 6.24 PSF. The maximum rate of air
- 18 leakage will not exceed 1.5 times the specified air leakage of 0.10 CFM per lineal foot of sash crack
- 19 for operating windows.
- 20 3. Conduct water penetration tests at a static pressure of 10.0 PSF.
- 21 4. All costs associated with the Post Installation Field Testing and required repair or replacements
- 22 shall be born by the Window Contractor. All tests are to be conducted by an accredited Testing
- 23 Laboratory in the presence of the Owner or the Owner's Representative.
- 24 5. Failure of the window unit or installation to pass these tests shall require the contractor and/or
- 25 manufacturer to pay costs necessary for correction, including removal of windows and providing
- 26 new windows from the same or another manufacturer.
- 27 6. If one of the two units fails either test, three additional units shall be tested. If one or more of the
- 28 three additional units fails either test, three more units shall be tested. This procedure shall
- 29 continue until all unit tests are passed.

30 **1.9 DELIVERY, STORAGE, AND HANDLING**

- 31 A. Deliver and handle window units under provisions of Section 01 60 0.
- 32 B. Store and protect window units under provisions of Section 01 60 0.

33 **1.10 WARRANTY**

- 34 A. Manufacturer's Warranty: Manufacturer agrees to repair or replace wood windows that fail in materials or
- 35 workmanship within specified warranty period.
- 36 1. Hardware: 10 years on hinges and handle assembly from the date of manufacture.
- 37 2. Exterior Finishes: 10 years from the date of manufacture.
- 38 3. Materials and Workmanship: 10 years from the date of manufacture.
- 39 B. Glass: Warranty period starts from the date of manufacture printed on the insulated glass spacer.
- 40 Insulating glass shall be warranted against obstruction of vision between interior glass surfaces (seal
- 41 failure) for a period of 10 years.

42 **PART 2 - PRODUCTS**

43 **2.1 ACCEPTABLE MANUFACTURERS**

- 44 A. H Window Company, LLC. 401 17th Avenue West Ashland, WI 54806
- 45 1. Phone: (800) 843-4929 Fax: (715) 685-9441

46 **2.2 MATERIALS**

- 47 A. Extruded Aluminum: (Exterior) 6063-T6 tempered aluminum frame, sash and glazing stop. Minimum wall
- 48 thickness to be 0.059 inches.
- 49 B. Interior Wood: Clear, free of finger joints, or veneer wrapped over finger jointed clear cut specie. Kiln dried
- 50 to a moisture content of 6-12 percent and preservative treated. Wood frame and sash will be a minimum of
- 51 1-1/4 inches thick.
- 52 1. Wood species shall be Reclaimed Ash as directed and sourced by Owner.
- 53 C. Insulating Glass: CBA rated dual seal clear insulating glass, 1-3/8 inch thick; DSB glass interior and
- 54 exterior with High Performance Low E on surface #2, argon gas filled and warm edge spacer technology.

- 1 D. Weather-stripping: Full perimeter high performance weather gasket. Double weather-strip at sill (above
2 and below operator).
3 E. Simulated True-Divided-Lite: Simulated true-divided-lite to be extruded aluminum grille, between glass
4 simulated spacer, supplied interior and exterior wood grille. Both exterior and interior grilles shall be easily
5 removable for cleaning of glass.

6 **2.3 WINDOWS (WDW-1)**

- 7 A. Window Type: Provide horizontally hinged, outward projecting 180 degree reversing windows, fixed sash
8 or direct set windows.
9 B. Configure as indicated on the elevation drawings and window details.
10 C. Window Hardware:
11 1. Hinges: Horizontal, 180-degree pivot. Zinc electroplated steel, yellow chromate and finished with a
12 hard clear lacquer. Front arm to be painted to match exterior color.
13 2. Operators: Provide one or more of the following sash operators.
14 a. Push bar operator in white, bronze or champagne
15 b. Roto operator in white, bronze, champagne or brass
16 c. Euro operator in chrome (no screen available)
17 d. Keyed custodial operator in chrome (no screen available)
18 D. Window Fabrication:
19 1. Corner Joinery: Sash and Frame
20 a. Wood fabrication: Mortise and tenon joints. Glued, stapled and caulked.
21 b. Aluminum fabrication: Sash: 45 degree mitered corners, double crimped to extruded
22 aluminum corner keys. Frame: Butt jointed corners sealed with gasket and silicone.
23 2. Composite Frame Construction: Fabricate window units with a continuous butyl tape or closed cell
24 foam thermal/moisture barrier, located between exterior aluminum and interior wood. Aluminum is
25 nailed to wood with stainless steel ring-shanked nails on 6 inch spacing around perimeter of frame
26 and sash.
27 3. Weep holes: Weep holes shall be processed into each sill to allow water drainage to exterior.
28 4. Wood Surfaces: Wood shall be smooth and free of surface defects.
29 5. Insulated glass: Glazing shall be factory-installed.
30 E. Window Accessories:
31 1. Positioning Fin: Attach vinyl positioning fin with pre-punched installation holes.
32 2. Mull Covers: Exterior aluminum, interior wood.
33 3. Screen: Extruded aluminum, 6063-T6 tempered aluminum frame with fiberglass mesh screen cloth.
34 4. Extension Jamb: Provide extension jamb in a depth of 0" - 8".
35 5. Receptor Panning: .080 extruded 6063-T6 aluminum finished to match windows. Provide in sizes to
36 cover all exterior exposed wood or metal.

37 **2.4 OUTSWING PATIO DOORS**

- 38 A. Product: Nordic Outswing Patio Doors as manufactured by H Window Company, LLC.
39 B. Frame:
40 1. Extruded aluminum fastened to an unfinished wood interior. The aluminum extrusion is .059, T-5
41 hardened material and is painted with a powder coat paint that meets AAMA 605 standard. A layer of
42 butyl tape is applied between the aluminum and the wood to create a thermal and moisture barrier. All
43 wood is pressure treated with a preservative to protect against moisture-related problems.
44 C. Sash:
45 1. The sash make-up is similar to the frame and contains full view glass to within 12" of the floor. The kick
46 panel at the bottom is solid wood with an aluminum insulated panel exterior, painted to match the frame.
47 The corners of the sash are mortised and tenoned, glued, and stapled to ensure a solid bond.
48 D. Glass:
49 1. The standard door glass is 1" thick overall, with two panes of tempered glass and a low emissivity (Low-E)
50 coating on surface #2. Each pane is separated with an insulating spacer, filled with argon gas, and sealed
51 airtight around the perimeter. Triple glazing is also available with an overall thickness of 1-3/8" with the
52 Low-E coating on surface #5. All glass is factory glazed prior to shipment.
53 E. Hardware:
54 1. The Nordic door contains four (4) exterior hinges for durability. A triple latching mechanism is used for
55 security and a tight seal against the elements. A brake is installed to allow the active door to be locked in
56 any open position. Door threshold covers are made from heavy gauge extruded aluminum and sent loose
57 for field installation. Door handles are chrome as standard. Double doors contain head and foot bolts that
58 release the passive door and allow both sides to open.
59 F. Screens:

- 1 1. Optional retractable screens are available upon request. These screens are housed in a canister
2 that fastens to the door jamb. When needed, the screen rolls across the opening and fastens to the
3 astragal with strong magnets. When not in use, the screen is stowed away out of sight.

4 **2.5 FINISHES**

- 5 A. Organic (Painted Finish)
6 1. Finish all exterior windows and components with a factory-applied coating in accordance with the
7 following Aluminum Association Designation:
8 a. Powder Coat or Kynar based 50% resin AAMA 2605.
9 B. Interior Wood: Wood shall be factory pre-finished utilizing a 3-coat post-catalyzed conversion varnish
10 sprayed finish prior to window assembly.
11 C. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact cementitious or
12 dissimilar materials.
13 D. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A386 to 2.0 oz/sq. ft. or primed with
14 iron oxide paint.

15 **PART 3 - EXECUTION**

16 **3.1 EXAMINATION**

- 17 A. New Construction: Verify wall openings and adjoining air and vapor seal materials are clean, dry and ready
18 to receive work of this Section. Verify that rough opening and masonry openings are correct and the sill
19 plate is level.

20 **3.2 PREPARATION**

- 21 A. Remove new windows from crating and packaging material. Verify that all parts and accessories are
22 included. All window units shall be securely stored, upright and protected from the weather.
23 B. Remove old windows and accessories from the window opening. Scrape and remove existing sealants
24 from the opening, which will interfere with the installation of the new windows.
25 C. Install only preservative treated lumber for liners and blocking. The shim space will be adequate in depth
26 to shim the entire depth of the new window frame.

27 **3.3 INSTALLATION**

- 28 A. Install window frames, glazing and reinforcement in strict accordance with manufacturer's instruction and
29 shop drawings.
30 B. Align window frame plumb and level, free of warp or twist. Maintain dimensional tolerances, aligning with
31 adjacent work.
32 C. Coordinate attachment and seal of air and vapor barrier materials. Install under sill and sill brake metal
33 flashing.
34 D. Pack fibrous insulation in shim spaces at perimeter to maintain continuity of thermal barrier.
35 E. Install perimeter sealant and backing materials in accordance with Section 07 90 0.

36 **3.4 ADJUST AND CLEAN**

- 37 A. Remove protective material from pre-finished aluminum surfaces.
38 B. Adjust operable hardware for smooth operation and tight fit of the sash.

39 **3.5 PROTECTION**

- 40 A. Protect the exterior finish on the windows when cleaning the building.

41 **END OF SECTION 08 52 00**

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1 SECTION 08 71 00
2 DOOR HARDWARE

- 3 PART 1 – GENERAL
4 1.1 CONDITIONS
5 1.2 WORK INCLUDED
6 1.3 RELATED WORK IN OTHER SECTIONS
7 1.4 REFERENCES
8 1.5 SUBMITTALS
9 1.6 QUALITY ASSURANCE
10 1.7 DELIVERY, STORAGE AND HANDLING
11 1.8 PREINSTALLATION MEETING
12 1.9 WARRANTY
13 PART 2 – PRODUCTS
14 2.1 FASTENERS
15 2.2 BUTT HINGES
16 2.3 CONTINUOUS GEARED HINGES
17 2.4 POWER TRANSFERS
18 2.5 FLUSH BOLTS AND DUST PROOF STRIKES
19 2.6 EXIT DEVICES
20 2.7 LOCKS AND LATCHES
21 2.8 PULLS, PUSH BARS, PUSH/PULL PLATES
22 2.9 COORDINATORS
23 2.10 CLOSERS
24 2.11 LOW ENERGY ELECTRO-HYDRAULIC AUTOMATIC OPERATORS
25 2.12 KICK PLATES AND MOP PLATE
26 2.13 OVERHEAD STOPS
27 2.14 WALL STOPS AND HOLDERS
28 2.15 WEATHERSTRIP, GASKETING
29 2.16 THRESHOLDS
30 2.17 ELECTRIC STRIKES
31 2.18 POWER SUPPLIES
32 2.19 DOOR POSITION SWITCHES
33 2.20 FINISHES AND BASE MATERIALS
34 2.21 KEYING
35 2.22 KEY CABINETS
36 PART 3 – EXECUTION
37 3.1 EXAMINATION
38 3.2 INSTALLATION
39 3.3 FIELD QUALITY CONTROL
40 3.4 ADJUSTMENT AND CLEANING
41 3.5 HARDWARE SCHEDULE

42 1. GENERAL

43 1.1 CONDITIONS

- 44 A. Conditions of the contract (General and Supplementary Conditions) and Division One General
45 Requirements, govern the work of this section.
- 46 B. This section includes all material, and related service necessary to furnish all finish hardware indicated on
47 the drawings, or specified herein.
- 48 C. Furnish UL listed hardware for all labeled and 20 min. openings in conformance with the requirements for
49 the class of opening scheduled. Underwriters' requirements shall have precedence over specification where
50 conflicts exist.
- 51 D. All work shall be in accordance with all applicable state and local building codes. Code requirements shall
52 have precedence over this specification where conflicts exist.

1 1.2 WORK INCLUDED

2 A. This section includes the following:

- 3 1. Furnish door hardware (for hollow metal, wood and aluminum doors) specified herein, listed in the
4 hardware schedule, and/or required by the drawings.
5 2. Cylinders for Aluminum Doors
6 3. Thresholds and Weather-stripping (Aluminum frame seals to be provided by aluminum door supplier)
7 4. Electro-Mechanical Devices
8 5. Access Control components and or systems specified within this section.

9 B. Where items of hardware are not definitely or correctly specified and is required for the intended service,
10 such omission, error or other discrepancy should be directed to the Architect prior to the bid date for
11 clarification by addendum. Otherwise furnish such items in the type and quantity established by this
12 specification for the appropriate service intended.

13 1.3 RELATED WORK IN OTHER SECTIONS

14 A. This section includes coordination with related work in the following sections:

- 15 1. Division 6 Section "Finish Carpentry".
16 2. Division 6 Section "Cabinet Hardware"
17 3. Division 8 Section "Hollow Metal Doors and Frames".
18 4. Division 8 Section "Wood Doors"
19 5. Division 8 Section "Aluminum Entrances and Storefronts"
20 6. Division 26 Sections "Electrical".
21 7. Division 28 Sections "Communication".

22 1.4 REFERENCES

23 A. Publications of agencies and organizations listed below form a part of this specification section to the extent
24 referenced.

- 25 1. DHI - Recommended Locations for Builders' Hardware.
26 2. NFPA 80 - Standards for Fire Doors and Windows.
27 3. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
28 4. UL - Building Material Directory.
29 5. DHI - Door and Hardware Institute
30 6. WHI - Warnock Hersey
31 7. BHMA - Builders Hardware Manufacturers Association
32 8. ANSI – American National Standards Institute
33 9. IBC 2009 - International Building Code 2009 Edition (as amended by local building code)
34 10. IEBC 2009 - International Building Code 2009 Edition (as amended by local building code)

35
36 1.5 SUBMITTALS

37 A. Within ten days after award of contract, submit detailed hardware schedule in quantities as required by
38 Division 1 - General Conditions.

39 B. Schedule format shall be consistent with recommendations for a vertical format as set forth in the Door &
40 Hardware Institute's (DHI) publication "Sequence and Format for the Hardware Schedule". Hardware sets
41 shall be consolidated to group multiple door openings which share similar hardware requirements.
42 Schedule shall include the following information:

- 43 1. Door number, location, size, handing, and rating.
44 2. Door and frame material, handing.
45 3. Degree of swing.
46 4. Manufacturer
47 5. Product name and catalog number
48 6. Function, type and style

- 1 7. Size and finish of each item
2 8. Mounting heights
3 9. Explanation of abbreviations, symbols, etc.
4 10. Numerical door index, indicating the hardware set/ group number for each door.
- 5 C. When universal type door closers are to be provided, the schedule shall indicate the application method to
6 be used for installation at each door: (regular arm, parallel arm, or top jamb).
- 7 D. The schedule will be prepared under the direct supervision of a certified Architectural Hardware Consultant
8 (AHC) employed by the hardware distributor. The hardware schedule shall be signed and embossed with
9 the DHI certification seal of the supervising AHC. The supervising AHC shall attend any meetings related to
10 the project when requested by the architect.
- 11 E. Hardware supplier shall field verify with the Owner all existing doors and frames within the scope of this
12 project to remain (including those to be relocated) for existing hardware suitability to remain I.L.O. specified
13 hardware prior to ordering new hardware, and check the specified hardware for suitability and adaptability
14 to the details and surrounding conditions.
- 15 F. Review drawings from related trades as required to verify compatibility with specified hardware. Indicate
16 unsuitable or in compatible items, and proposed substitutions in the hardware schedule.
- 17 G. Provide documentation for all hardware to be furnished on labeled fire doors indicating compliance with
18 positive pressure fire testing UL 10C.
- 19 H. Furnish manufacturers' catalog data for each item of hardware in quantities as required by Division 1 -
20 General Conditions.
- 21 I. Submit a sample of each type of hardware requested by the architect. Samples shall be of the same finish,
22 style, and function as specified herein. Tag each sample with its permanent location so that it may be used
23 in the final work.
- 24 J. Furnish with first submittal, a list of required lead times for all hardware items.
- 25 K. After final approved schedule is returned, transmit corrected copies for distribution and field use in
26 quantities as required by Division 1 - General Conditions.
- 27 L. Furnish approved hardware schedules, template lists, and pertinent templates as requested by related
28 trades.
- 29 M. Furnish necessary diagrams, schematics, voltage and amperage requirements for all electro-mechanical
30 devices or systems as required by related trades. Wiring diagrams shall be opening specific and include
31 both a riser diagram and point to point diagram showing all wiring terminations.
- 32 N. After receipt of approved hardware schedule, Hardware supplier shall initiate a meeting including the
33 owner's representative to determine keying requirements. Upon completion of the initial key meeting,
34 hardware supplier shall prepare a proposed key schedule with symbols and abbreviations as set forth in the
35 door and hardware institute's publication "Keying Procedures, Systems, and Nomenclature". Submit copies
36 of owner approved key schedule for review and field use in quantities as required by Division 1 - General
37 Conditions. Wiring diagrams shall be included in final submittals transmitted for distribution and field use.
- 38 1.6 QUALITY ASSURANCE
- 39 A. Manufacturers and model numbers listed are to establish a standard of function and quality. Similar items
40 by approved manufacturers that are equal in design, function, and quality, may be considered for prior
41 approval of the architect, provided the required data and physical samples are submitted for approval as set
42 forth in Division One General Requirements.
- 43 B. Where indicated in this specification, products shall be independently certified by ANSI for compliance with
44 relevant ANSI/BHMA standards A156.1 - A156.36 – Standards for Hardware and Specialties. All products

- 1 shall meet or exceed certification requirements for the respective grade indicated within this specification.
2 Supplier shall provide evidence of certification when requested by the architect.
- 3 C. Obtain each type of hardware (hinges, latch & locksets, exit devices, closers, etc.) from a single
4 manufacturer, although several may be indicated as offering products complying with requirements.
- 5 D. Electrical drawings and electrical specifications are based on the specific electrified hardware components
6 specified in hardware sets. When electronic hardware components other than those indicated in hardware
7 sets are provided, the supplier shall be responsible for all costs incurred by the design team and their
8 consultants to review, and revise electrical drawings and electrical specifications. Supplier shall also be
9 responsible for any additional costs associated with required changes in related equipment, materials,
10 installation, or final hook up to ensure the system will operate and function as indicated in the construction
11 documents, including hardware set operational / functional descriptions.
- 12 E. All hardware items shall be manufactured no earlier than 6 months prior to delivery to site.
- 13 F. Hardware supplier shall be factory trained and certified by the manufacture to provide and support all
14 computer managed locks and system components.
- 15 G. Installation of hardware shall be installed or directly supervised and inspected by a skilled installer certified
16 by the manufacturer of locksets, door closers, and exit devices used on the project, or with not less than 3
17 years' experience in successful completion of projects similar in size and scope.
- 18 H. Provide hardware for all labeled fire doors, which complies with positive pressure fire testing UL 10C.
- 19 I. Comply with all applicable provisions of the standards referenced within section 1.4 of this specification.
- 20 J. Hardware supplier shall participate when reasonably requested to meet with the contractor and or architect
21 to inspect any claim for incorrect or non-functioning materials; following such inspection, the hardware
22 supplier shall provide a written statement documenting the cause and proposed remedy of any unresolved
23 items.
- 24 1.7 DELIVERY, STORAGE AND HANDLING
- 25 A. Hardware supplier shall deliver hardware to the job site unless otherwise specified.
- 26 B. All hardware shall be delivered in manufacturers' original cartons and shall be clearly marked with set and
27 door number.
- 28 C. Coordinate with contractor prior to hardware delivery and recommend secure storage and protection
29 against loss and damage at job site.
- 30 D. Contractor shall receive all hardware and provide secure and proper protection of all hardware items to
31 avoid delays caused by lost or damaged hardware. Contractor shall report shortages to the Architect and
32 hardware supplier immediately after receipt of material at the job site.
- 33 E. Coordinate with related trades under the direction of the contractor for delivery of hardware items
34 necessary for factory installation.
- 35 1.8 PRE-INSTALLATION MEETING
- 36 A. Schedule a hardware pre-installation meeting on site to review and discuss the installation of continuous
37 hinges, locksets, door closers, exit devices, overhead stops, and electromechanical door hardware.
- 38 B. Meeting attendees shall be notified 7 days in advance and shall include: Architect, Contractor, Door
39 Hardware Installers (including low voltage hardware), Manufacturers representatives for above hardware
40 items, and any other effected subcontractors or suppliers.

1 C. All attendees shall be prepared to distribute installation manuals, hardware schedules, templates, and
2 physical hardware samples.

3 1.9 WARRANTY

4 A. All hardware items shall be warranted against defects in material and workmanship as set forth in Division
5 One General Requirements.

6 B. Repair, replace, or otherwise correct deficient materials and workmanship without additional cost to owner.

7 PART 2 - PRODUCTS

8 2.1 FASTENERS

9 A. All exposed fasteners shall be Phillips head or as otherwise specified, and shall match the finish of the
10 adjacent hardware. All fasteners ex-posed to the weather shall be non-ferrous or stainless steel. Furnish
11 correct fasteners to accommodate surrounding conditions.

12 B. Coordinate required reinforcements for doors and frames. Seek approval of the architect prior to furnishing
13 through-bolts. Furnish through-bolts as required for materials not readily reinforced.

14 2.2 BUTT HINGES

15 A. Acceptable manufacturers and respective catalog numbers:

	<u>Ives</u>	<u>Stanley</u>	<u>Hager</u>	<u>McKinney</u>
1. Standard Weight, Ball Bearing	5BB1	BB179	BB1279	TB2714
2. Standard Weight, Ball Bearing, Non-Ferrous	5BB1	FBB191	BB1191	TB2314
3. Heavy Weight, Ball Bearing	5BB1HW	FBB168	BB1168	T4B3786
4. Heavy Weight, Ball Bearing, Non-Ferrous	5BB1HW	FBB199	BB1199	T4B3386

16 B. Hinges shall be independently certified by ANSI for compliance with ANSI A156.1 (2006). Hinges shall
17 meet or exceed the following ANSI grade requirements as indicated below:

- 18 1. Standard Weight, 2 Ball Bearing Hinges: Grade 2
19 2. Heavy Weight, 4 Ball Bearing Hinges: Grade 1

20 C. Unless otherwise specified, furnish the following hinge quantities for each door leaf.

- 21 1. 3 hinges for doors up to 90 inches.
22 2. 1 additional hinge for every 30 inch on doors over 90 inches.
23 3. 4 hinges for Dutch door applications.

24 D. Unless otherwise specified, top and bottom hinges shall be located as specified in division 8 Section
25 "Hollow Metal Doors and Frames". Intermediate hinges shall be located equidistant from others.

26 E. Unless otherwise specified, furnish hinge weight and type as follows:

- 27 1. Standard weight: ball bearing hinge 5BB1 for interior opening over 36 through 40 inches wide without a
28 door closer, and for interior openings through 40 inches wide with a door closer.
29 2. Heavyweight: 4 ball bearing hinge 5BB1HW for interior openings over 40 inches wide, and for all
30 vestibule doors.
31 3. Heavyweight: 4 ball bearing hinge 5BB1HWss for exterior openings unless otherwise listed in groups.

- 1 F. Unless otherwise specified, furnish hinges for exterior doors, fabricated from brass, bronze, or stainless
2 steel. Unless otherwise specified, hinges for interior doors may be fabricated from steel.
- 3 G. Unless otherwise specified, furnish hinges in the following sizes:
- 1. 5" x 5" 2-1/4" thick doors
 - 2. 4-1/2" x 4-1/2" 1-3/4" thick doors
 - 3. 3-1/2" x 3-1/2" 1-3/8" thick doors
- 4 H. Furnish hinges with sufficient width to accommodate trim and allow for 180-degree swing.
- 5 I. Unless otherwise specified, furnish hinges with flat button tips with non-rising pins at interior doors, non-
6 removable loose pins (NRP) at exterior and out-swinging interior doors.
- 7 J. Unless otherwise specified, furnish all hinges to template standards.

8 2.3 POWER TRANSFERS

- 9 A. Acceptable manufacturers and respective catalog numbers:

Von Duprin

- | | |
|--------------------------------|---------|
| 1. Concealed Two Wire | EPT-2 |
| 2. Concealed Ten Wire | EPT-10 |
| 3. Armored Door Cord Four Wire | 788C-12 |
| 4. Armored Door Cord Four Wire | 788C-18 |

- 10 B. Door cords shall be armored cable with screw on caps.
- 11 C. Concealed power transfers shall be concealed in the door and frame when the door is closed.
- 12 D. Concealed power transfers shall have a steel tube to protect wires from being cut.
- 13 E. Concealed power transfers with spring tubes shall be rejected.
- 14 F. Concealed power transfers shall be supplied with a mud box to house all terminations.

15 2.4 FLUSH BOLTS AND DUST PROOF STRIKES

- 16 A. Acceptable manufacturers and respective catalog numbers:

	<u>Ives</u>	<u>Door Controls</u>	<u>Hager</u>
1. Dust Proof Strike	DP2	80	280X
2. Auto Flush Bolt (Metal Door)	FB31P	842	292D
3. Auto Flush Bolt (Wood Door)	FB41P	942	291D
4. Manual Flush Bolt	FB458	780	282D

- 1 B. Unless otherwise specified, provide 12" rods for manual flush bolts for door 7'6" or less, 24" top rods for
2 doors over 7'6" to 8'6".
- 3 C. Unless otherwise specified, provide doors over 8'6" with automatic top bolts.
- 4 D. Provide automatic flush bolts where required to maintain fire door listing and or egress requirements on
5 pairs of doors.
- 6 E. All flush-bolt applications shall be UL listed to be installed with top flush-bolt only. Provide auxiliary fire bolt
7 as required for fire rated openings where less bottom bolt has been specified.
- 8 F. Provide all bottom flush bolts with non-locking dust proof strikes.

9 2.5 EXIT DEVICES

- 10 A. Acceptable manufacturers and respective catalog numbers:

	<u>Von Duprin</u>	<u>No Substitution</u>
1. Narrow Stile, Push Pad	33A Series	
2. Narrow Stile, Electric Latch Retraction (motor driven)	QEL 33A Series	
3. Lever Trim	Latitude	
4. Pull Trim	IVES 8190 Series	

- 11 A. Exit devices shall be independently certified by ANSI for compliance with ANSI A156.3, Grade 1 (2008).
- 12 B. Obtain exit devices from a single manufacturer, although several may be indicated as offering products
13 complying with requirements.
- 14 C. All exit devices shall be equipped with a sound-dampening feature to reduce touch pad return noise.
- 15 D. Quiet Electric Latch Retraction shall be accomplished using a motor driven assembly, and shall incorporate
16 the following features:
 - 17 1. Motor shall retract both the push pad assembly and latchbolt.
 - 18 2. Automatic calibration of latch throw and pull.
 - 19 3. Built-in time delay.
 - 20 4. On-board installation and troubleshooting diagnostics built into power supply and device.
 - 21 5. Retry mode if device does not pull on the first try.
- 22 E. On full glass doors there shall be no exposed fasteners on the back of the mechanism visible through the
23 glass.
- 24 F. All exit devices shall be provided with flush end caps to reduce potential damage from impact.
- 25 G. All exit devices shall be provided with dead-locking latch bolts to ensure security.
- 26 H. All exit devices shall be U.L. listed for accident hazard. Exit device for use on fire doors shall also be U.L.
27 listed for fire exit hardware.

- 1 I. Provide optional strikes, special length rods, and adapter plates to accommodate door and frame
2 conditions. Provide narrow style series devices in lieu of wide stile series devices where optional strikes
3 will not accommodate door and frame conditions.
- 4 J. Coordinate with related trades to ensure adequate clearance and reinforcement is provided in doors and
5 frames. Provide thru bolts as required.
- 6 K. Refer to hardware groups for exit device applications utilizing the option of: "less bottom rod and floor
7 strike" (LBR)
- 8 L. All exit devices shall be provided with optional trim designs to match other lever and pull designs used on
9 the project.
- 10 M. Unless specific exit device dogging options are noted within hardware sets, provide dogging options as
11 follows:
- 12 N. Fire Rated devices: Dogging not permitted.
- 13 O. Non-Rated Exit Only functions not equipped with outside trim or pull: Less Dogging.
- 14 P. Non-Rated Classroom functions: Less Dogging.
- 15 Q. Non-Rated devices utilizing electric latch retraction or electrified outside trim: Less Dogging.
- 16 R. All Other Non-Rated devices: Cylinder Dogging utilizing interchangeable core cylinders. Cylinder keyway
17 shall match locksets furnished on this project.
- 18 S. Provide glass bead kits as required to accommodate door conditions. Screws shall not be visible through
19 full glass doors.
- 20 T. Where specified, provide compatible keyed mullions with cylinder for pairs of doors.
- 21 U. Provide reinforced crossbars for all traditional style exit devices applied to doors over 36" wide.

22 2.6 LOCKS AND LATCHES

- 23 A. Acceptable manufacturers and respective catalog numbers:

Schlage

No Substitution

1. Grade 1 Mortise L Series Latitude x N Escutcheon

- 24 B. Bored locks shall be independently certified by ANSI for compliance with ANSI A156.2 (2011).
25 Interconnected locks shall be independently certified by ANSI for compliance with ANSI A156.12 (2013).
26 Mortise locks shall be independently certified by ANSI for compliance with ANSI A156.13 (2012).

- 27 C. Minimize transmission of heat to lock trim. Provide temperature control modules (TCM) on all electrified
28 locks when cataloged by the lock manufacturer.

- 29 D. Unless otherwise specified, all locks and latches to have:

- 30 1. 2-3/4" Backset
31 2. 1/2" minimum throw latchbolt
32 3. 1" throw deadbolt
33 4. 6 pin cylinders
34 5. ANSI A115.2 strikes

- 1 E. Provide guarded latch bolts for all locksets, and latch bolts with sufficient throw to maintain fire rating of
2 both single and paired door assemblies.
- 3 F. Length of strike lip shall be sufficient to clear surrounding trim.
- 4 G. Provide wrought boxes for strikes at inactive doors, wood frames, and metal frames without integral mortar
5 covers.

6 2.7 PULLS, PUSH BARS, PUSH/PULL PLATES

- 7 A. Acceptable manufacturers and respective catalog numbers:

	<u>Burns</u>	<u>Hager</u>	<u>Ives</u>
1. Straight Pull (1" dia., 10" ctc)	26C	4J	8103-0
2. Straight Pull (3/4" dia., 8" ctc)	25B	3G	8102-8
3. Offset Door Pull (1" dia., 10" ctc)	39C	12J	8190-0
4. Pull / Push-Bar (1" dia., 10" ctc Pull)	422 x 26C	153	9103-0
5. Offset Pull / Push-Bar (1" dia., 10" ctc Pull)	422 x 39C	159	9190-0
6. Push Plate (.050 4"X 16")	54	30S 4 x 16	8200 4 x 16
7. Push Plate (.050 6"X 16")	56	30S 6 x 16	8200 6" X 16"
8. Pull Plate (1" dia., 10" ctc - .050" X 4" X 16")	5426C	34J 4 x 16	8303-0 4" X 16"

- 8 B. Adjust dimensions of push plates to accommodate stile and rail dimensions, lite and louver cutouts, and
9 adjacent hardware. Where required by adjacent hardware, push plates shall be factory drilled for cylinders
10 or other mortised hardware. All push plates shall be beveled 4 sides and counter sunk.

- 11 C. Where possible, provide back-to-back, and concealed mounting for pulls and push bars. Push bar length
12 shall be 3" less door width, or center of stile to center of stile for stile & rail or full glass doors.

13 2.8 COORDINATORS

- 14 A. Acceptable manufacturers and respective catalog numbers:

	<u>Ives</u>	<u>Door Controls</u>	<u>Hager</u>
1. Bar Coordinator	COR x FL	600 x Filler	297D x 297F
2. Mounting Bracket	MB Series	AB, C Series	297 Series

- 15 B. Provide coordinators at all pairs of doors having automatic flush bolts and closers on the inactive leaf, and
16 for pairs of doors having vertical rod/mortise exit device combinations with overlapping astragals.

- 17 C. Provide appropriate filler bars, closer mounting brackets, carry bars, and special top latch preparations as
18 required by adjacent hardware.

19 2.9 CLOSERS

- 20 A. Acceptable manufacturers and respective catalog numbers:

- | | <u>LCN</u> | <u>Sargent</u> | <u>No Substitution</u> |
|----|-----------------|--|------------------------|
| | 1. 4040XP / EDA | 281 / 281P10 (less PRV valve) | |
| 1 | B. | Door closers shall be independently certified by ANSI for compliance with ANSI A156.4, Grade 1 (2013). | |
| 2 | C. | Obtain door closers from a single manufacturer, although several may be indicated as offering products | |
| 3 | | complying with requirements. | |
| 4 | D. | Provide extra heavy duty arm (EDA / HD) when closer is to be installed using parallel arm mounting. | |
| 5 | E. | Hardware supplier shall coordinate with related trades to ensure aluminum frame profiles will accommodate | |
| 6 | | specified door closers. | |
| 7 | F. | Provide "SPECIAL TEMPLATE - #1728 / #0723" closer arms as required to accommodate aluminum frame | |
| 8 | | head details with "non-structural stops" when closers will be required to utilize parallel arm mounting | |
| 9 | | positions. Frame mounting shoe shall be shortened, and pivot hub height shall be increased to permit | |
| 10 | | frame mounted shoe to be positioned on frame rabbit (rather than the frame stop), and behind the frame | |
| 11 | | stop rather than on top of the frame stop. Contact LCN Door Closers at: 877-671-7011 for pricing and | |
| 12 | | design assistance. | |
| 13 | G. | Closers shall use high strength cast iron cylinders, forged main arms, and 1 piece forged steel pistons. | |
| 14 | H. | Closers shall utilize a stable fluid withstanding temperature range of +120deg F to -30deg F without | |
| 15 | | seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors shall be | |
| 16 | | provided with temperature stabilizing fluid that complies with standards UL10C. | |
| 17 | I. | Unless otherwise specified, all door closers shall have full covers and separate adjusting valves for sweeps, | |
| 18 | | latch, and backcheck. | |
| 19 | J. | Provide closers for all labeled doors. Provide closer series and type consistent with other closers for similar | |
| 20 | | doors specified elsewhere on the project. | |
| 21 | K. | Provide closers with adjustable spring power. Size closers to ensure exterior and fire rated doors will | |
| 22 | | consistently close and latch doors under existing conditions. Size all other door closers to allow for reduced | |
| 23 | | opening force not to exceed 5 lbs. | |
| 24 | L. | Install closers on the room side of corridor doors, stair side of stairways and interior side of exterior doors. | |
| 25 | M. | Closers shall be furnished complete with all mounting brackets and cover plates as required by door and | |
| 26 | | frame conditions, and by adjacent hardware. | |
| 27 | N. | Door closers shall be provided with a powder coat finish to provide superior protection against the effects of | |
| 28 | | weathering. Powder coat finish shall successfully pass a 100 hour salt spray test. | |
| 29 | O. | Pressure Relief Valve, PRV, shall not be acceptable. | |

30 2.10 LOW ENERGY ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

- 31 A. Acceptable manufacturers and respective catalog numbers:

	<u>Stanley</u>	<u>LCN</u>	<u>No Substitutions</u>
1.	Electro-Hydraulic Operator	Magic-Force	
2.	Push-'n'-Go Operator	2810 / 9530	

- 32 B. Low energy operators shall be independently certified by ANSI for compliance with ANSI A156.19 (2002).

- 1 C. Where low kinetic energy, as defined by ANSI/BHMA Standard A156.19, power operators are indicated for
2 doors required to be accessible to the disabled, provide electrically powered operators complying with the
3 ADA for opening force and time to close standards.
- 4 D. The closing action shall be controlled by modern type cast iron door closer cylinder filled with a flat viscosity
5 fluid, stable from +120F to -30F that would require no seasonal adjustments. The closer shall have field
6 adjustable spring power; have two independent closing speed adjustment valves, and hydraulic back-
7 check.
- 8 E. Full closing force shall be provided when the power or assist cycle ends.
- 9 F. All power operator systems shall include the following features and functions:
- 10 1. Provisions for separate conduits to carry high and low voltage wiring in compliance with the National
11 Electrical Code, section 725-31.
- 12 2. The operator will be designed with an electronically controlled mechanical clutching mechanism to
13 prevent damage to the operator if the system is actuated while the door is latched or if the door is
14 forced closed during the opening cycle.
- 15 3. All covers, mounting plates and arm systems shall be powder coated and successfully pass a minimum
16 of 100 hours testing as outlined in ANSI/BHMA Standard A156.18.
- 17 4. UL listed for use on labeled doors.
- 18 5. All operators shall be non-handed with spring power over a range of at least four sizes; either 1 through
19 4 or 2 through 5.
- 20 6. The power operator shall incorporate microprocessor controlled digital controls including: factory default
21 memory settings, on-board diagnostics, non-volatile memory, and integrated delay and relay for
22 controlling door release devices.
- 23 7. Provisions in the control box or module shall provide control (inputs and outputs) for; electric strike
24 delay, auxiliary contacts, sequential operation, fire alarms systems, actuators, swing side sensors, and
25 stop side sensors.
- 26 8. Wall mounted actuators shall consist of a 4-1/2 inch diameter stainless steel touch plate with a blue
27 filled handicapped symbol. Switches shall be weather resistant and mount on a single gang electrical
28 box furnished by Division 16.
- 29 G. All electrically powered operators shall include the following features or functions:
- 30 1. When an obstruction or resistance to the opening swing is encountered, the operator will pause at that
31 point, then attempt to continue opening the door. If the obstruction or resistance remains, the operator
32 will again pause the door.
- 33 2. Easily accessible main power and maintain hold open switches will be provided on the operator.
- 34 3. An electronically controlled clutch to provide adjustable opening force.
- 35 4. A microprocessor to control all motor and clutch functions.
- 36 5. An on-board power supply capable of delivering both 12V and 24V outputs up to a maximum of 1.0
37 ampere combined load.
- 38 6. All input and output power wiring shall be protected by slow blow fuses. These fuses shall be easily
39 replaceable without special tools or component replacement.
- 40 7. If electrical failure occurs, the unit shall operate as a standard door closer.

1 H. Power Operators shall be warranted by the manufacturer to be free from defects in material and
2 workmanship for a period of two years.

3 2.11 KICK PLATES AND MOP PLATES

4 A. Furnish protective plates as specified in hardware groups.

5 B. Where specified, provide 10" kick plates, 34" armor plates, and 4" mop plates. Unless otherwise specified,
6 metal protective plates shall be .050" thick; plastic plates shall be 1/8" thick.

7 C. Protective plates shall be 2" less door width, or 1" less door width at pairs. All protective plates shall be
8 beveled 4 sides and counter sunk. Protection plates over 16" shall not be provided for labeled doors unless
9 specifically approved by door manufacturers listing.

10 D. Where specified, provide surface mounted door edges. Edges shall butt to protective plates. Provide
11 edges with cutouts as required adjacent hardware.

12 E. Adjust dimensions of protection plates to accommodate stile and rail dimensions, lite and louver cutouts,
13 and adjacent hardware. Where required by adjacent hardware, protection plates shall be factory drilled for
14 cylinders or other mortised hardware.

15 2.12 OVERHEAD STOPS

16 A. Acceptable manufacturers and respective catalog numbers:

	<u>Glynn-Johnson</u>	<u>Rixson</u>	<u>Sargent</u>
1. Heavy Duty Surface Mount	GJ900 Series	9 Series	590
2. Heavy Duty Concealed Mount	GJ100 Series	1 Series	690
3. Medium Duty Surface Mount	GJ450 Series	10 Series	1540
4. Medium Duty Concealed Mount	GJ410	2 Series	1530

17 B. Unless otherwise specified, furnish GJ900 series overhead stop for hollow metal or 1-3/4" solid core doors
18 equipped with regular arm surface type closers that swing more than 140 degrees before striking a wall, for
19 hollow metal or 1-3/4" solid core doors that open against equipment, casework, sidelights, or other objects
20 that would make wall bumpers inappropriate, and as specified in hardware groups.

21 C. Furnish sex bolt attachments for wood and mineral core doors unless doors are supplied with proper
22 reinforcing blocks.

23 D. Provide special stop only ("SE" suffix) overhead stops when used in conjunction with electronic hold open
24 closers.

25 E. Do not provide holder function for labeled doors.

26 2.13 WALL STOPS AND HOLDERS

27 A. Acceptable manufacturers and respective catalog numbers:

	<u>Ives</u>	<u>Hager</u>	<u>Burns</u>
1. Wrought Convex Wall Bumper	WS406CVX	232W	570
2. Wrought Concave Wall Bumper	WS406CCV	236W	575

3.	Extended Wall Stop	WS11/WS11X	255W	530
4.	Extended Wall Stop	WS33/WS33X	****	****
5.	Automatic Wall Holder	WS40	326W	533
6.	Hinge Pin Stop	70	****	****
7.	Kick-down holder	FS452	-	-

1 B. Furnish a stop or holder for all doors. Furnish floor stops or hinge pin stops only where specifically
 2 specified.

3 C. Where wall stops are not applicable, furnish overhead stops.

4 D. Do not provide holder function for labeled doors.

5 2.14 MAGNETIC HOLD OPENS

6 A. Acceptable manufacturers and respective catalog numbers:

	<u>LCN</u>	<u>ABH</u>	<u>Edwards</u>
1. Wall Holder	SEM 7800	2000	1500

7 B. Magnetic hold opens shall be independently certified by ANSI for compliance with ANSI A156.15, Grade 1
 8 (2006).

9 C. Magnetic holder's housing and armature shall be constructed of a die cast zinc material.

10 D. Provide types as listed in groups.

11 E. Where wall conditions do not permit the armature to reach the magnet, provide extensions.

12 F. Provide proper voltage and power consumption as required by Division 16.

13 G. Coordinate electrical requirements and mounting locations with other trades.

14 2.15 WEATHERSTRIP, GASKETING

15 A. Acceptable manufacturers and respective catalog numbers:

	<u>Zero</u>	<u>Pemko</u>	<u>NGP</u>	<u>Reese</u>
1. Weatherstrip	30-Series	2891_PK	700NA	755
2. Adhesive Gasket	188	S88	5050	797
3. Mullion Seal/Silencer	8780	5110	5100N	
4. Meeting Edge Seals	381	18041	9605	959
5. Adhesive Edge Seal	****	S77	5060	****
6. Automatic Door Bottom (Surface Mtd.)	321	4131	222	320

7.	Automatic Door Bottom (HD Concealed) (When Sealing Against A Solid Surface)	360	434_RL	423N	430
8.	Automatic Door Bottom (HD Concealed) (When Sealing Against Carpet)	360	434_NBL	683	943
9.	Automatic Door Bottom	355	420APKL	320N	372A
10.	Sweeps	8192	18061_NB	B606	964
11.	Sweep w/ drip	8198	345_N	C627	354
12.	Drip Cap	142	346	16	R201

- 1 B. Weatherstrip and gasketing shall be independently certified by ANSI for compliance with ANSI A156.22
2 (2005).
- 3 C. Where specified in the hardware groups, furnish the above products unless otherwise detailed in groups.
- 4 D. Provide weatherstripping all exterior doors and where specified.
- 5 E. Provide intumescent and other required edge sealing systems as required by individual fire door listings to
6 comply with positive pressure standards UL 10C.
- 7 F. Provide Zero 188 smoke gaskets at all fire rated doors and smoke and draft control assemblies.
- 8 G. Provide gasketing for all meeting edges on pairs of fire doors. Gasketing shall be compatible with astragal
9 design provided by door supplier as required for specific fire door listings.

10 2.16 THRESHOLDS

- 11 A. Acceptable manufacturers and respective catalog numbers:

	<u>Zero</u>	<u>Pemko</u>	<u>NGP</u>	<u>Reese</u>
1. Rabbeted Thresholds	566A	2005T	896	S483

- 12 B. Thresholds shall be independently certified by ANSI for compliance with ANSI A156.21 (2001).
- 13 C. Hardware supplier shall verify all finish floor conditions and coordinate proper threshold as required to
14 ensure a smooth transition between threshold and interior floor finish.
- 15 D. Threshold Types:
- 16 1. Unless otherwise specified, provide saddle threshold similar to Zero 566A for all exterior openings with
17 an interior floor finish less than or equal to 1/4" in height.

18 2.17 ELECTRIC STRIKES

- 19 A. Acceptable manufacturers and respective catalog numbers:

	<u>Von Duprin</u>	<u>Folger Adams</u>
1. Type 1	6000 Series	300 Series

- 1 B. Provide electric strikes designed for use with the type of locks shown at each opening where specified.
- 2 C. Electric strikes shall be UL listed as Burglary-Resistant Electric Door Strikes and where required shall be
3 UL listed as Electric Strike for Fire Doors.
- 4 D. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.
- 5 2.18 POWER SUPPLIES
- 6 A. Provide quantities and types as specified in hardware sets. Shared power supplies will not be accepted
7 without prior approval from the owner.
- 8 B. All power supplies shall have the following features:
9 1. 12/24 VDC Output, field selectable.
10 2. Class 2 Rated power limited output.
11 3. Universal 120-240 VAC input.
12 4. Low voltage DC, regulated and filtered.
13 5. Polarized connector for distribution boards.
14 6. Fused primary input.
15 7. AC input and DC output monitoring circuit w/LED indicators.
16 8. Cover mounted AC Input indication.
17 9. Tested and certified to meet UL294.
18 10. NEMA 1 enclosure.
19 11. Hinged cover w/lock down screws.
20 12. High voltage protective cover.
- 21 C. All power supplies shall incorporate fused distribution boards.
- 22 D. All electro-mechanical systems requiring fail safe circuits shall be capable of interfacing with the fire alarm
23 system to cut power to appropriate system components. Unless already provided in another system
24 component, all power supplies utilized in fail safe circuits shall include an integral relay which when
25 connected to the N/C fire alarm contact will cut power to all openings connected to the individual power
26 supply. Power supply, unless otherwise specified, will automatically reset itself when fire alarm relay returns
27 to normal state following a fire alarm.

28 2.19 DOOR POSITION SWITCHES

- 29 A. Acceptable manufacturers and respective catalog numbers:

	<u>Schlage Electronics</u>	<u>Sentrol</u>	<u>Sargent</u>
1. Concealed (wood & hollow metal doors)	679 Series	1076W	3287
2. Concealed (aluminum doors)	7764	*****	****

30

1 2.20 FINISHES AND BASE MATERIALS

2 A. All hollow metal doors and aluminum doors shall be provided with hardware finished per the table below.
3 Wood exterior door hardware will be finished per the wood exterior door manufacturer's standard finish
4 range, to be selected by the architect as part of the submittal review process.

5 B. Unless otherwise indicated in the hardware groups or herein, hardware finishes shall be applied over base
6 metals as specified in the following finish schedule:

<u>HARDWARE ITEM</u>	<u>BHMA FINISH AND BASE MATERIAL</u>
1. Butt Hinges: Exterior, or Non-Ferrous	630 (US32D - Satin Stainless Steel)
2. Butt Hinges: Interior	BLK
3. Flush Bolts	BLK
4. Exit Devices and Exit Device Trim	BLK
5. Locks and Latches	BLK
6. Pulls and Push Plates/Bars	BLK
7. Coordinators	BLK (Prime painted or mill alum.)
8. Closers	BLK (Powder Coat Aluminum)
9. Protective Plates	630 (US32D - Satin Stainless Steel)
10. Overhead Stops	BLK
11. Wall Stops and Holders	630 (US32D - Satin Stainless Steel)
12. Thresholds	628 (Mill Aluminum)
13. Weather-strip, Sweeps Drip Caps (wood and hollow metal doors)	Aluminum Anodized
14. Weather-strip, Sweeps Drip Caps (aluminum doors)	Match finish of doors.
15. Magnetic Holders	Sprayed Aluminum
16. Magnetic Locks	628 (US28)
17. Miscellaneous	BLK

7
8

9 2.21 KEYING

10 A. Provide all cylinders in keyways as required to accommodate owners existing key system.

11 B. All locks under this section shall be keyed as directed by the owner to an existing Master Key System.

- 1 C. Furnish a total of 2 keys per cylinder. Actual cut keys to be determined by owner.
- 2 D. Master keys, control keys, and change keys shall be delivered by registered mail to the owner.
3 Construction keys shall be delivered to the contractor.
- 4 PART 3 - EXECUTION
- 5 3.1 EXAMINATION
- 6 A. Prior to installation of hardware, installer shall examine door frame installation to ensure frames have been
7 set square and plumb. Installer shall examine doors, door frames, and adjacent wall, floor, and ceiling for
8 conditions, which would adversely affect proper operation and function of door assemblies. Do not proceed
9 with hardware installation until such deficiencies have been corrected.
- 10 3.2 INSTALLATION
- 11 A. Before hardware installation, general contractor/construction manager shall coordinate a hardware
12 installation seminar with a 1 week notice to all parties involved. The seminar is to be conducted on the
13 installation of hardware, specifically of locksets, closers, exit devices, continuous hinges and overhead
14 stops. Manufacturer's representative of the above products to present seminar. Seminar to be held at the
15 job site and attended by installers of hardware (including low voltage hardware) for aluminum, hollow metal
16 and wood doors. Training to include use of installation manuals, hardware schedule, templates and
17 physical products samples.
- 18 B. Install all hardware in accordance with the approved hardware schedule and manufacturers' instructions for
19 installation and adjustment.
- 20 C. Set units level, plumb and true to the line and location. Adjust and reinforce the attachment substrate as
21 necessary for proper installation and operation.
- 22 D. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and
23 anchors in accord with industry standards.
- 24 E. Drill appropriate size pilot holes for all hardware attached to wood doors and frames.
- 25 F. Shim doors as required to maintain proper operating clearance between door and frame.
- 26 G. Unless otherwise specified, locate all hardware in accordance with the recommended locations for builders
27 hardware for standard doors and frames as published by the Door and Hardware Institute.
- 28 H. Use only fasteners supplied by or approved by the manufacturer for each respective item of hardware.
- 29 I. Mortise and cut to close tolerance and conceal evidence of cutting in the finished work.
- 30 J. Conceal push and pull bar fasteners where possible. Do not install through bolts through push plates.
- 31 K. Install hardware on UL labeled openings in accordance with manufacturer's requirements to maintain the
32 label.
- 33 L. Apply self-adhesive gasketing on frame stop at head & latch side and on rabbet of frame at hinge side.
- 34 M. Install hardware in accordance with supplemental "S" label instructions on all fire rated openings.
- 35 N. Install wall stops to contact lever handles or pulls. Do not mount wall stops on casework, or equipment.
- 36 O. Where necessary, adjust doors and hardware as required to eliminate binding between strike and latchbolt.
37 Doors should not rattle.

- 1 P. Overhead stops used in conjunction with electrified hold open closers shall be templated and installed to
2 coincide with engagement of closer hold open position.
- 3 Q. Install door closers on corridor side of lobby doors, room side of corridor doors, and stair side of stairways.
- 4 R. Adjust spring power of door closers to the minimum force required to ensure exterior and fire rated doors
5 will consistently close and latch doors under existing conditions. Adjust all other door closers to ensure
6 opening force does not to exceed 5 lbs.
- 7 S. Adjust "sweep", "latch", & "back check" valves on all door closers to properly control door throughout the
8 opening and closing cycle. Adjust total closing speed as required to comply with all applicable state and
9 local building codes.
- 10 T. Install "hardware compatible" (bar stock) type weather stripping continuously for an uninterrupted
11 seal. Adjust templating for parallel arm door closers, exit devices, etc., as required to accommodate
12 weather stripping.
- 13 U. Unless otherwise specified or detailed, install thresholds with the bevel in vertical alignment with the outside
14 door face. Notch and closely fit thresholds to frame profile. Set thresholds in full bed of sealant.
- 15 V. Compress sweep during installation as recommended by sweep manufacturer to facilitate a water resistant
16 seal.
- 17 W. Deliver to the owner 1 complete set of installation and adjustment instructions, and tools as furnished with
18 the hardware.
- 19 3.3 FIELD QUALITY CONTROL
- 20 A. After installation has been completed, the hardware supplier and manufacturers' representative for
21 locksets, door closers, exit devices, and overhead stops shall check the project and verify compliance with
22 installation instructions, adjustment of all hardware items, and proper application according to the approved
23 hardware schedule. Hardware supplier shall submit a list of all hardware that has not been installed
24 correctly.
- 25 B. After installation has been completed, the hardware supplier and manufacturers' representative shall meet
26 with the owner to explain the functions, uses, adjustment, and maintenance of each item of hardware.
27 Hardware supplier shall provide the owner with a copy of all wiring diagrams. Wiring diagrams shall be
28 opening specific and include both a riser diagram and point to point diagram showing all wiring
29 terminations.
- 30 3.4 ADJUSTMENT AND CLEANING
- 31 A. At final completion, and when H.V.A.C. equipment is in operation, installer shall make final adjustments to
32 and verify proper operation of all door closers and other items of hardware. Lubricate moving parts with
33 type lubrication recommended by the manufacturer.
- 34 B. All hardware shall be left clean and in good operation. Hardware found to be disfigured, defective, or
35 inoperative shall be repaired or replaced.
- 36

1 3.5 HARDWARE SCHEDULE

2 A. The following schedule of hardware groups are intended to describe opening function. The hardware
3 supplier is cautioned to refer to the preamble of this specification for a complete description of all materials
4 and services to be furnished under this section.

5

6 **HW SET: 01 [NOT USED]**

7

3	EA	BUTT HINGES	5BB1	IVE
1	EA	CLASSROOM LOCK	L9070	SCH
1	EA	WALL STOP	WS406/407CVX	IVE

8

9 FUNCTION: L9070 (F05) Classroom Lock

10 Latchbolt retracted by lever from either side unless outside is locked by key. Unlocked from outside by key. Inside
11 lever always free for immediate exit. Auxiliary latch deadlocks latchbolt when door is closed.

12

13 **HW SET: 02 [NOT USED]**

14

3	EA	BUTT HINGES	5BB1	IVE
1	EA	PASSAGE SET	L9010	SCH
1	EA	WALL STOP	WS406/407CVX	IVE

15

16 FUNCTION: L9010 (F01) Passage Latch

17 Latchbolt retracted by lever from either side at all times.

18

19 **HW SET: 03 [NOT USED]**

20

3	EA	BUTT HINGES	5BB1	IVE
1	EA	INSTITUTION LOCK	L9082	SCH
1	EA	WALL STOP	WS406/407CVX	IVE

21

22 FUNCTION: L9082 Institution Lock

23 Latchbolt retracted by key from either side. Lever on both sides always inoperative. Auxiliary latch deadlocks latchbolt
24 when door is closed.

25

26 Hardware supplier shall field verify existing door and frame will accommodate specified hardware.

27

28 **HW SET: 04 [furniture storage doors 103A, 103B]**

29

6	EA	BUTT HINGES	5BB1	IVE
2	EA	MANUAL FLUSH BOLT	FB458	IVE
2	EA	SURFACE CLOSERS	4040XP / 4040 EDA	LCN
1	EA	CLOSING COORDINATOR	COR-FL	IVE
1	EA	STOREROOM LOCK	L9080	SCH
2	EA	WALL STOPS	WS406/407CVX	IVE
1	EA	OVERLAP ASTRAGAL	(BY DOOR SUPPLIER)	

30

31 FUNCTION: L9080 (F07) Storeroom Lock

32 Latchbolt retracted by key outside or by lever inside. Outside lever always inoperative. Auxiliary latch deadlocks
33 latchbolt when door is closed.

34

1 **HW SET: 04A [JC door 101, fire protection room door 106, fog room door 38]**

2

3	EA	BUTT HINGES	5BB1	IVE
1	EA	STOREROOM LOCK	L9080	SCH
1	EA	SURFACE CLOSER	4040XP / 4040 EDA	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E CS	IVE
1	EA	WALL STOP	WS406/407CVX	IVE
1	EA	SMOKE SEAL	188S	ZER

3

4 FUNCTION: L9080 (F07) Storeroom Lock

5 Latchbolt retracted by key outside or by lever inside. Outside lever always inoperative. Auxiliary latch deadlocks
6 latchbolt when door is closed.

7

8 **HW SET: 04B [Level 1 door 123E, and Level 2 storage room door 211]**

9

3	EA	BUTT HINGES	5BB1	IVE
1	EA	PASSAGE SET	L9010	SCH
1	EA	SURFACE CLOSER	4040XP / 4040 EDA	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E CS	IVE
1	EA	WALL STOP	WS406/407CVX	IVE
1	EA	SMOKE SEAL	188S	ZER

10

11 FUNCTION: L9010 (F01) Passage Latch

12 Latchbolt retracted by lever from either side at all times.

13

14 **HW SET: 05 [restroom doors 104, 105 and level 2 restroom door 202]**

15

3	EA	BUTT HINGES	5BB1	IVE
1	EA	PRIVACY W/DB & IND	L9496 L583-363	SCH
1	EA	PUSH-N-GO CLOSER	9540 PUSH	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E CS	IVE
1	EA	WALL STOP	WS406/407CVX	IVE
1	EA	SEALS	188S	ZER

16

17 FUNCTION: L9496 Privacy With "OCCUPIED" Indicator

18 Lever retracts latchbolt from either side. Deadbolt thrown or retracted by key outside (retraction by key required in the
19 event of an emergency) or inside thumbturn. Throwing deadbolt locks outside lever and displays "OCCUPIED" plate.
20 Rotating inside lever simultaneously retracts both deadbolt and latchbolt and unlocks outside lever.

21

22 **HW SET: 06 [elev. equipment room door 120C]**

23

3	EA	BUTT HINGES	5BB1	IVE
1	EA	STOREROOM LOCK	L9080	SCH
1	EA	SMOKE SEAL	188S	ZER

24

25 FUNCTION: L9080 (F07) Storeroom Lock

26 Latchbolt retracted by key outside or by lever inside. Outside lever always inoperative. Auxiliary latch deadlocks
27 latchbolt when door is closed.

28

29

30

1 **HW SET: 07 [mechanical room doors 120A and 120B.]**

2

6	EA	BUTT HINGE	5BB1	IVE
2	EA	POWER TRANSFER	EPT10	VON
1	SET	AUTO FLUSH BOLT	FB31P / FB41P	IVE
1	EA	DUST PROOF STRIKE	DP2	IVE
1	EA	STOREROOM LOCK	L9080	SCH
1	EA	SURFACE CLOSER	4040XP	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B4E CS	IVE
1	EA	SMOKE SEAL	188S	ZER
1	EA	OVERLAP ASTRAGAL	(BY DOOR SUPPLIER)	
1	EA	MEETING EDGE SEALS	S772	ZER
2	SET	PERIMETER SEALS	312_R	PEMKO
2	EA	BOTTOM SEALS	4131_RL	PEMKO
		CREDENTIAL READER	(BY TECHNOLOGY CONTRACTOR)	
2	EA	DOOR CONTACT	679 SERIES	SCE
1	EA	POWER SUPPLY	(BY ELECTRICAL CONTRACTOR)	
1	EA	WIRING DIAGRAMS	RISER & POINT-TO-POINT (BY HARDWARE SUPPLIER)	

3 FUNCTION: L9080 (F07) Storeroom Lock

4 Latchbolt retracted by key outside or by lever inside. Outside lever always inoperative. Auxiliary latch deadlocks
5 latchbolt when door is closed.

6

7 **HW SET: 08 [outside classroom storage room door 125]**

8

6	EA	BUTT HINGES	5BB1	IVE
2	EA	MANUAL FLUSH BOLT	FB458	IVE
1	EA	DUST PROOF STRIKE	DP2	IVE
1	EA	STOREROOM LOCK	L9080	SCH
2	EA	OH STOP & HOLDER	90H	GLY
2	EA	ARMOR PLATE	8400 34" X 2" LDW B4E CS	IVE
1	EA	SEALS	188S	ZER
1	EA	OVERLAP ASTRAGAL	(BY DOOR SUPPLIER)	
1	EA	MEETING EDGE SEALS	188S	ZER
1	EA	CLOSING COORDINATOR	COR-FL	IVE
2	EA	DOOR SWEEP	8192	ZER
1	EA	THRESHOLD	PROFILE AS REQUIRED	ZER

9

10 FUNCTION: L9080 (F07) Storeroom Lock

11 Latchbolt retracted by key outside or by lever inside. Outside lever always inoperative. Auxiliary latch deadlocks
12 latchbolt when door is closed.

13

14 **HW SET: 09 [smoke doors along atrium pedestrian link: 150C and 150D]**

15

3	EA	BUTT HINGES	5BB1	IVE
1	EA	POWER TRANSFER	EPT10	VON
1	EA	STOREROOM LOCK	L9080	SCH
1	EA	EMAG SURFACE CLOSER	SENTRONIC	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E CS	IVE
1	EA	SMOKE SEAL	188S	ZER
1	EA	DOOR CONTACT	679 SERIES	SCE
1	EA	POWER SUPPLY	(BY ELECTRICAL CONTRACTOR)	
1	EA	WIRING DIAGRAMS	RISER & POINT-TO-POINT (BY HARDWARE SUPPLIER)	

16

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1 FUNCTION: Closer maglock released when emergency alarm is activated (Fail safe). Latchbolt retracted by key
2 outside or lever inside. Auxiliary latch deadlocks latchbolt when door is closed. Inside lever always free for immediate
3 exit.

4

5 **HW SET: 10 [Outside classroom doors from Classroom 3: 123D]**

6

8	EA	BUTT HINGES	5BB1	IVE
2	EA	POWER TRANSFER	EPT10	VON
1	EA	ELEC PANIC HARDWARE	CD-EL-3347A-EO	VON
1	EA	ELEC PANIC HARDWARE	QEL+-3347A-NL-OP	VON
2	EA	TRIM	8190-10"	IVE
3	EA	INTERCHANGEABLE CORE	CYLINDER AS REQUIRED	SCH
1	EA	SURF. AUTO OPERATOR	Magic-Force	Stanley
1	EA	ACTUATOR, WALL MOUNT	8310-813 (Touchless)	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B4E CS	IVE
1	EA	SMOKE SEALS	188S	ZER
1	EA	MEETING EDGE SEALS (NEOPRENE)	35AA (EACH LEAF)	ZER
	SET	WEATHERSTRIPPING	30	ZER
1	EA	MEETING EDGE SEALS (BRUSH)	381	ZER
2	EA	DOOR SWEEP (BRUSH)	8198	ZER
1	EA	THRESHOLD	PROFILE AS REQUIRED	ZER
1	EA	RAIN DRIP	142A	ZER

7

8 FUNCTION: (NL) Latchbolt retracted inside by exit device push pad and outside by key in cylinder. Door locks when
9 key is removed and door is closed. Access from exterior when exit device push pad is dogged down. This door has
10 a power operator. Interior actuator always active to unlock and open the door. A valid credential will unlock the active
11 door and make the exterior actuator active. Loss of power or activation of fire alarm will disable power operator and
12 ensure fire door remains latched.
13

14 **HW SET: 11 [Classroom doors 121A, 121B, 122A, 122B, 123A, 123B]**

15

3	EA	BUTT HINGES	5BB1	IVE
1	EA	CLASSROOM LOCK	L9070	SCH
2	EA	SURFACE CLOSER	4040XP HCUSH	LCN
1	EA	SMOKE SEALS	188S	ZER

16

17 FUNCTION: (F01) Passage Latch
18 Latchbolt retracted by lever from either side at all times.

19

20 Provide complete latching assembly including lock body, strike, scalp, spindle, levers, roses, cylinder, cylinder cam,
21 blocking ring, and all required fasteners.

22

23 Hardware supplier shall coordinate with related trades to ensure door and frame construction will accommodate
24 specified hardware.

25

26

27

28

29

1 **HW SET: 11A [Director's Office Door 213]**

2

3	EA	BUTT HINGES	5BB1	IVE
1	EA	OFFICE LOCK	L9070	SCH
1	EA	SMOKE SEALS	188S	ZER
1	EA	WALL STOP	WS406/407CCV	IVE

3

4 FUNCTION: (F01) Office Latch

5 Latchbolt retracted by lever from either side unless outside is locked by key. Unlocked from outside by key. Inside
6 lever always free for immediate exit. Auxiliary latch deadlocks latchbolt when door is closed.

7

8 Provide complete latching assembly including lock body, strike, scalp, spindle, levers, roses, cylinder, cylinder cam,
9 blocking ring, and all required fasteners.

10

11 Hardware supplier shall coordinate with related trades to ensure door and frame construction will accommodate
12 specified hardware.

13

14 **HW SET: 12 [Data Closet door 102]**

3	EA	BUTT HINGES	5BB1	IVE
2	EA	POWER TRANSFER	EPT10	VON
1	EA	STOREROOM LOCK	L9080	SCH
1	EA	SURFACE CLOSER	4040XP / 4040 EDA	LCN
1	EA	WALL STOP	WS406/407CCV	IVE
			(Where Applicable)	
		CREDENTIAL READER	(BY TECHNOLOGY CONTRACTOR)	
2	EA	DOOR CONTACT	7764	SCE
1	EA	WIRING DIAGRAMS	RISER & POINT-TO-POINT (BY HARDWARE SUPPLIER)	
1	EA	POWER SUPPLY	PS902 900-4R FA900	SCE

15

16 FUNCTION: Electrically Unlocked (Fail Secure)

17 Outside lever unlocked by 24V AC or DC. Latchbolt retracted by key outside or lever inside. Auxiliary latch deadlocks
18 latchbolt when door is closed. Inside lever always free for immediate exit. Valid credential unlocks door.

19

20 Provide complete latching assembly including lock body, strike, scalp, spindle, levers, roses, cylinder, cylinder cam,
21 blocking ring, and all required fasteners.

22

23 Hardware supplier shall coordinate with related trades to ensure door and frame construction will accommodate
24 specified hardware.

25

26 **HW SET: 13 [door 150A from lobby to garden plaza]**

27

8	EA	BUTT HINGES	5BB1	IVE
2	EA	POWER TRANSFER	EPT10	VON
1	EA	ELEC PANIC HARDWARE	CD-EL-3347A-EO	VON
1	EA	ELEC PANIC HARDWARE	QEL-3347A-NL-OP	VON
2	EA	TRIM	8190-10"	IVE
3	EA	INTERCHANGEABLE CORE	CYLINDER AS REQUIRED	SCH
1	EA	SURF. AUTO OPERATOR	Magic-Force	Stanley
1	EA	ACTUATOR, WALL MOUNT	8310-813 (Touchless)	LCN
1	EA	ACTUATOR, BOLLARD MOUNT	8310-836T (Locate at Exterior - 36" Tall)	LCN
	EA	WEATHERSTRIP	BY DR/FR SUPPLIER	

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2	EA	DOOR SWEEP	8192	ZER
1	EA	THRESHOLD CREDENTIAL READER	PROFILE AS REQUIRED (BY TECHNOLOGY CONTRACTOR)	ZER
2	EA	DOOR CONTACT	7764	SCE
1	EA	WIRING DIAGRAMS	RISER & POINT-TO-POINT (BY HARDWARE SUPPLIER)	
1	EA	POWER SUPPLY	PS902 900-4R FA900	SCE

1
2 FUNCTION: (NL) Latchbolt retracted inside by exit device push pad and outside by key in cylinder. Door locks when
3 key is removed and door is closed. Access from exterior when exit device push pad is dogged down.
4

5 **HW SET: 13A [door 110 from circulation hallway to garden]**

6

8	EA	BUTT HINGES	5BB1	IVE
2	EA	POWER TRANSFER	EPT10	VON
1	EA	ELEC PANIC HARDWARE	CD-EL-3347A-EO	VON
1	EA	ELEC PANIC HARDWARE	QEL-3347A-NL-OP	VON
2	EA	TRIM	8190-10"	IVE
3	EA	INTERCHANGEABLE CORE	CYLINDER AS REQUIRED	SCH
1	EA	SURF. AUTO OPERATOR	Magic-Force	Stanley
2	EA	ACTUATOR, WALL MOUNT	8310-813 (Touchless)	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B4E CS	IVE
	EA	WEATHERSTRIP	BY DR/FR SUPPLIER	
2	EA	DOOR SWEEP	8192	ZER
1	EA	THRESHOLD CREDENTIAL READER	PROFILE AS REQUIRED (BY TECHNOLOGY CONTRACTOR)	ZER
2	EA	DOOR CONTACT	7764	SCE
1	EA	WIRING DIAGRAMS	RISER & POINT-TO-POINT (BY HARDWARE SUPPLIER)	
1	EA	POWER SUPPLY	PS902 900-4R FA900	SCE

7
8 FUNCTION: (NL) Latchbolt retracted inside by exit device push pad and outside by key in cylinder. Door locks when
9 key is removed and door is closed. Access from exterior when exit device push pad is dogged down.
10

11 **HW SET: 13B [door 100 from circulation hallway to link zone]**

12

6	EA	BUTT HINGES	5BB1	IVE
2	EA	POWER TRANSFER	EPT10	VON
1	EA	ELEC PANIC HARDWARE	CD-EL-3347A-EO-DT	VON
1	EA	ELEC PANIC HARDWARE	QEL-3347A-NL-DT	VON
2	EA	TRIM	8190-10"	IVE
3	EA	INTERCHANGEABLE CORE	CYLINDER AS REQUIRED	SCH
2	EA	SURFACE CLOSER	4040XP HCUSH	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B4E CS	IVE
		CREDENTIAL READER	(BY TECHNOLOGY CONTRACTOR)	
2	EA	DOOR CONTACT	7764	SCE
1	EA	WIRING DIAGRAMS	RISER & POINT-TO-POINT (BY HARDWARE SUPPLIER)	
1	EA	POWER SUPPLY	PS902 900-4R FA900	SCE

13

1 FUNCTION: (NL) Latchbolt retracted inside by exit device push pad and outside by key in cylinder. Door locks when
2 key is removed and door is closed. Access from exterior when exit device push pad is dogged down.
3

4 **HW SET: 14 [L-2 elevator lobby to terrace: door 201B]**

5

4	EA	BUTT HINGES	5BB1	IVE
1	EA	POWER TRANSFER	EPT10	VON
1	EA	ELEC PANIC HARDWARE	QEL-3347A-EO-DT	VON
1	EA	TRIM	8190-10"	IVE
1	EA	INTERCHANGEABLE CORE	CYLINDER AS REQUIRED	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	LCN
1	EA	SURF. AUTO OPERATOR	Magic-Force	Stanley
2	EA	ACTUATOR, WALL MOUNT	8310-813 (Touchless)	LCN
1	EA	WEATHERSTRIP	BY DR/FR SUPPLIER	
1	EA	DOOR SWEEP	8192	ZER
1	EA	THRESHOLD CREDENTIAL READER	PROFILE AS REQUIRED (BY TECHNOLOGY CONTRACTOR)	ZER
1	EA	DOOR CONTACT	7764	SCE
1	EA	WIRING DIAGRAMS	RISER & POINT-TO-POINT (BY HARDWARE SUPPLIER)	
1	EA	POWER SUPPLY	PS902 900-4R FA900	SCE

6
7 FUNCTION: (NL) Latchbolt retracted inside by exit device push pad and outside by key in cylinder. Door locks when
8 key is removed and door is closed. Access from exterior when exit device push pad is dogged down.
9

10 **HW SET: 15 [Level 2 office area door to terrace: 210]**

11

4	EA	BUTT HINGES	5BB1	IVE
1	EA	POWER TRANSFER	EPT10	VON
1	EA	ELEC PANIC HARDWARE	QEL-3347A-EO-DT	VON
1	EA	TRIM	8190-10"	IVE
1	EA	INTERCHANGEABLE CORE	CYLINDER AS REQUIRED	SCH
1	EA	SURFACE CLOSER	4040 SCUSH	LCN
1	EA	WEATHERSTRIP	BY DR/FR SUPPLIER	
1	EA	DOOR SWEEP	8192	ZER
1	EA	DOOR CONTACT	7764	SCE
1	EA	THRESHOLD CREDENTIAL READER	PROFILE AS REQUIRED (BY TECHNOLOGY CONTRACTOR)	ZER
1	EA	WIRING DIAGRAMS	RISER & POINT-TO-POINT (BY HARDWARE SUPPLIER)	
1	EA	POWER SUPPLY	PS902 900-4R FA900	SCE

12
13 FUNCTION: (NL) Latchbolt retracted inside by exit device push pad and outside by key in cylinder. Door locks when
14 key is removed and door is closed. Access from exterior when exit device push pad is dogged down.
15
16
17
18
19
20
21
22

1 **HW SET: 15A [Level 2 single door to office: door 201A]**

2

3	EA	BUTT HINGES	5BB1	IVE
1	EA	POWER TRANSFER	EPT10	VON
1	EA	ELEC PANIC HARDWARE	CD-3347A-EO	VON
1	EA	TRIM	8190-10"	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH	LCN
1	EA	INTERCHANGEABLE CORE	CYLINDER AS REQUIRED	SCH
		CREDENTIAL READER	(BY TECHNOLOGY CONTRACTOR)	
1	EA	WIRING DIAGRAMS	RISER & POINT-TO-POINT (BY HARDWARE SUPPLIER)	
1	EA	POWER SUPPLY	PS902 900-4R FA900	SCE

3

4 FUNCTION: (NL) Latchbolt retracted inside by exit device push pad and outside by key in cylinder. Door locks when
5 key is removed and door is closed. Access from exterior when exit device push pad is dogged down.

6

7 **HW SET: 16 [double door to greenhouse link: GH01.]**

8

8	EA	BUTT HINGES	5BB1	IVE
2	EA	POWER TRANSFER	EPT10	VON
2	EA	ELEC FIRE EXIT HARDWARE	QEL-3347A-EO-F	VON
2	EA	TRIM	8190-10"	IVE
1	EA	INTERCHANGEABLE CORE	CYLINDER AS REQUIRED	SCH
1	EA	SURF. AUTO OPERATOR	Magic-Force	Stanley
2	EA	ACTUATOR, WALL MOUNT	8310-813 (Touchless)	LCN
2	EA	KICK PLATE	8400 48" X 42" LDW B4E CS	IVE
1	EA	SMOKE SEALS	188S	ZER
2	EA	DOOR SWEEP	8192	ZER
2	EA	DOOR CONTACT	679 SERIES	SCE
		CREDENTIAL READER	(BY TECHNOLOGY CONTRACTOR)	
1	EA	WIRING DIAGRAMS	RISER & POINT-TO-POINT (BY HARDWARE SUPPLIER)	
1	EA	POWER SUPPLY	PS902 900-4R FA900	SCE

9

10 FUNCTION: (DT) Latchbolt retracted inside by exit device push pad. Wall mounted key switch will dog exit device
11 push pad down. Access from exterior when exit device push pad is dogged down. Loss of power or activation of fire
12 alarm will release push pad, and ensure fire door is latched.

13

14 **HW SET: 17 [Hallway closet doors 112A-F, 113, 114A-F, 115, 116A-F (11 pairs)]**

15

1	PR	CENTER PIVOT HINGES	7253	IVE
1	EA	CYLINDER LOCK HOUSING	L463	SCH
2	EA	MAGNETIC CATCH	326	IVE
2	EA	MANUAL FLUSH BOLT	FB458	IVE
2	EA	RECESSED PULLS	962	IVE

16

17 FUNCTION: Pull only from hallway side. Center pivot hinges only.

18

19 Provide lock body, strike, roses, cylinder, cylinder cam, blocking ring, and all required fasteners.

20

1 Hardware supplier shall coordinate with related trades to ensure door and frame construction will accommodate
2 specified hardware.

3
4
5
6

7 **HW SET: 18 [Classroom sliding markerboard doors 121C, 122C, 122C (3 pairs)]**

8

2	PR	SLIDING TRACK SYSTEM	SDR-A125SYN	SUGATSUNE
1	EA	MAGNETIC CATCH	326	IVE
2	EA	TAB PULLS	DP3D (satin chrome)	DOUG MOCKETT
4	EA	RUBBER BUMPER	PFBS	PEMKO

9

10 FUNCTION: Pull only from classroom side

11

12 Provide complete bi-parting, synchronized sliding track system, wheels, end stops, floor guides and all required
13 fasteners. Provide two bumpers per leaf, staggered.

14

15 Hardware supplier shall coordinate with related trades to ensure door and frame construction will accommodate
16 specified hardware.

17

18 **HW SET: 19 [Greenhouse door operator actuators: 1 pair per greenhouse corridor doorway (4 # doorways).]**

19

2	EA	ACTUATOR, WALL MOUNT	8310-813 (Touchless)	LCN
---	----	----------------------	-------------------------	-----

20 FUNCTION: Door operator actuators in greenhouse corridor and growing zones. All other door hardware in
21 greenhouse by greenhouse subcontractor – see sheet GH10 for details.

22

23 Hardware supplier shall coordinate with related trades to ensure door and frame construction will accommodate
24 specified hardware.

25

25 **HW SET: 20 [Bolz Conservatory 90 min rated doors: 150E and 150F.]**

26 **SEE SPECIFICATION 084410: FIRE RATED ALUM. CURTAIN WALL.**

27

28

29

30

END OF SECTION

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SECTION 08 80 00
GLAZING

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28 **PART 1 - GENERAL**

- 29 **1.1 RELATED DOCUMENTS**
- 30 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
- 31 Division 01 Specification Sections, apply to this Section.

- 32 **1.2 SUMMARY**
- 33 A. Section includes:
- 34 1. Glass for windows, doors, interior borrowed lites, storefront framing, glazed curtain walls, skylights.
- 35 2. Glazing sealants and accessories.

- 36 **1.3 COORDINATION**
- 37 A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face
- 38 clearances, and adequate sealant thicknesses, with reasonable tolerances.

- 39 **1.4 ACTION SUBMITTALS**
- 40 A. Product Data: For each type of product.
- 41 B. Sustainable Design Submittals:
- 42 1. Product Data: For sealants, indicating VOC content.
- 43 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting
- 44 materials.
- 45 C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- 46 D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same
- 47 designations indicated on Drawings.
- 48 E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design
- 49 criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their
- 50 preparation.

- 51 **1.5 INFORMATIONAL SUBMITTALS**
- 52 A. Preconstruction adhesion and compatibility test report.

1 **1.6 QUALITY ASSURANCE**

2 A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021
3 to conduct the testing indicated.

4 **1.7 PRECONSTRUCTION TESTING**

5 A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing
6 accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

7 1. Testing is not required if data are submitted based on previous testing of current sealant products
8 and glazing materials matching those submitted.

9 **1.8 WARRANTY**

10 A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass
11 units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects
12 developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated
13 glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications
14 of deterioration in coating.

15 1. Warranty Period: 10 years from date of Substantial Completion.

16 B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units
17 that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of
18 hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning
19 insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision
20 by dust, moisture, or film on interior surfaces of glass.

21 1. Warranty Period: 10 years from date of Substantial Completion.

22 **PART 2 - PRODUCTS**

23 **2.1 MANUFACTURERS**

24 A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may
25 be incorporated into the Work include, but are not limited to the following:

- 26 1. Guardian Industries Corp.; SunGuard.
- 27 2. Oldcastle BuildingEnvelope™.
- 28 3. PPG Flat Glass; PPG Industries, Inc.
- 29 4. Viracon, Inc.

30 **2.2 PERFORMANCE REQUIREMENTS**

31 A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality
32 Requirements," to design glazing.

33 B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions
34 indicated determined according to the International Building Code and ASTM E 1300.

- 35 1. Design Wind Pressures: As indicated on Drawings.
- 36 2. Design Snow Loads: 40 PSF.
- 37 3. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the
38 glass.
- 39 4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within
40 individual glass lites.

41 C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201,
42 Category II.

43 D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as
44 indicated in manufacturer's published test data, based on procedures indicated below:

- 45 1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2
46 computer program, expressed as Btu/sq. ft. x h x deg F.
- 47 2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to
48 NFRC 200 and based on LBL's WINDOW 5.2 computer program.
- 49 3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

50 **2.3 GLASS PRODUCTS, GENERAL**

51 A. Glazing Publications: Comply with published recommendations of glass product manufacturers and
52 organizations below unless more stringent requirements are indicated. See these publications for glazing
53 terms not otherwise defined in this Section or in referenced standards.

- 54 1. GANA Publications: Glazing Manual."

- 1 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for
2 Sealed Insulating Glass Units for Commercial and Residential Use."
3 B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label
4 of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate
5 manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
6 C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component
7 lite of units with appropriate certification label of IgCC.
8 D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with
9 performance requirements and is not less than the thickness indicated.
10 E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float
11 glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-
12 strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide
13 fully tempered float glass.

14 **2.4 GLASS PRODUCTS**

- 15 A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
16 B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless
17 otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
18 C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A
19 (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
20 D. Ceramic-Coated Vision Glass: ASTM C 1048, Condition C, Type I, Class 1 (clear) or Class 2 (tinted) as
21 indicated, Quality-Q3; and complying with Specification No. 95-1-31 in GANA's "Engineering Standards
22 Manual."

23 **2.5 INSULATING GLASS**

- 24 A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a
25 dehydrated interspace, qualified according to ASTM E 2190.
26 1. Sealing System: Dual seals.
27 2. Spacer: Thermally broken Aluminum with mill or clear anodic finish.

28 **2.6 GLAZING SEALANTS**

- 29 A. General:
30 1. Compatibility: Compatible with one another and with other materials they contact, including glass
31 products, seals of insulating-glass units, and glazing channel substrates, under conditions of service
32 and application, as demonstrated by sealant manufacturer based on testing and field experience.
33 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing
34 sealants suitable for applications indicated and for conditions existing at time of installation.
35 3. Sealant shall have a VOC content of 250 g/L or less.
36 4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
37 B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS,
38 Class 100/50, Use NT or as recommended by glass manufacturer for glazing application.

39 **2.7 GLAZING TAPES**

- 40 A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape;
41 nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as
42 recommended in writing by tape and glass manufacturers for application indicated; and complying with
43 ASTM C 1281 and AAMA 800 for products indicated below:
44 1. AAMA 804.3 tape, where indicated.
45 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
46 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
47

- 1 B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both
2 surfaces; and complying with AAMA 800 for the following types:
3 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
4 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of
5 liquid sealant.

6 **2.8 MISCELLANEOUS GLAZING MATERIALS**

- 7 A. Window Film, Privacy (**WF-1**)
8 1. Manufacturer: 3M.
9 2. Product: Fasara Glass Finish.
10 3. Pattern: Milky White (Milano), SH2MAML.
11 B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
12 C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
13 D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to
14 maintain glass lites in place for installation indicated.
15 E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
16 F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to
17 control glazing sealant depth and otherwise produce optimum glazing sealant performance.

18 **PART 3 - EXECUTION**

19 **3.1 GLAZING, GENERAL**

- 20 A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing
21 materials, unless more stringent requirements are indicated, including those in referenced glazing
22 publications.
23 B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project
24 site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other
25 imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
26 C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction
27 testing.
28 D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless
29 otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel
30 bead.
31 E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
32 F. Provide spacers for glass lites where length plus width is larger than 50 inches.
33 G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing
34 channel, as recommended in writing by glass manufacturer and according to requirements in referenced
35 glazing publications.
36 H. Film Installation, General:
37 1. Install in accordance with manufacturer's instructions.
38 2. Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of
39 window sealant. Use new blade tips after 3 to 4 cuts.
40 3. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon
41 of water, on window glass and adhesive to facilitate proper positioning of film.
42 4. Apply film to glass and lightly spray film with slip solution.
43 5. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
44 6. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
45 7. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly,
46 and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.
47 8. If completing an exterior application, check with the manufacturer as to whether edge sealing is
48 required.

49 **3.2 TAPE GLAZING**

- 50 A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or
51 protrude slightly above sightline of stops.
52 B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them
53 fit opening.
54 C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing
55 joints by applying tapes to jambs, then to heads and sills.

- 1 D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in
- 2 tapes with compatible sealant approved by tape manufacturer.
- 3 E. Apply heel bead of elastomeric sealant.
- 4 F. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense
- 5 compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket
- 6 applications at corners and work toward centers of openings.
- 7 G. Apply cap bead of elastomeric sealant over exposed edge of tape.

8 **3.3 GASKET GLAZING (DRY)**

- 9 A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with
- 10 allowance for stretch during installation.
- 11 B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints
- 12 miter cut and bonded together at corners.
- 13 C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly
- 14 against soft compression gasket by inserting dense compression gaskets formed and installed to lock in
- 15 place against faces of removable stops. Start gasket applications at corners and work toward centers of
- 16 openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass.
- 17 Seal gasket joints with sealant recommended by gasket manufacturer.
- 18 D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly
- 19 against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying
- 20 pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without
- 21 developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- 22 E. Install gaskets so they protrude past face of glazing stops.

23 **3.4 SEALANT GLAZING (WET)**

- 24 A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and
- 25 glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel
- 26 and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in
- 27 position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- 28 B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant
- 29 to glass and channel surfaces.
- 30 C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

31 **3.5 CLEANING AND PROTECTION**

- 32 A. Immediately after installation remove nonpermanent labels and clean surfaces.
- 33 B. Protect glass from contact with contaminating substances resulting from construction operations. Examine
- 34 glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during
- 35 construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
- 36 1. If, despite such protection, contaminating substances do come into contact with glass, remove
- 37 substances immediately as recommended in writing by glass manufacturer. Remove and replace
- 38 glass that cannot be cleaned without damage to coatings.
- 39 C. Remove and replace glass that is damaged during construction period.

40 **3.6 MONOLITHIC GLASS SCHEDULE**

- 41 A. Glass Type (GL-1): Clear float glass, tempered where indicated on the drawings.
- 42 1. Minimum Thickness: Refer to Material Tag index.
- 43 2. Safety glazing required where indicated on the drawings.
- 44

- 1 **3.7 INSULATING GLASS SCHEDULE**
- 2 A. Glass Type **(IGU-1)**: Low-E-coated, clear insulating glass to new exterior windows and curtain wall.
- 3 1. Basis-of-Design Cardinal Glass: Double-Pane Clear 1 inch Argon.
- 4 2. H-WINDOW: Solar Control SC+HSG CARDINAL: LoE366#2; U-VALUE (MAX): 0.20; VLT (MIN):
- 5 63% SHGC (MAX): 0.27.
- 6 3. Safety: T indicates Tempered.
- 7 4. Overall Unit Thickness: 1 inch.
- 8 5. Outdoor Lite: 1/4 inch Heat-strengthened float glass.
- 9 6. Interspace Content: Argon.
- 10 7. Indoor Lite: 1/4 inch Annealed float glass.
- 11 8. Safety glazing required where noted on the drawings.

12 **END OF SECTION**

SECTION 08 91 19
FIXED LOUVERS

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19 **PART 1 - GENERAL**

20 **1.1 RELATED DOCUMENTS**

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

23 **1.2 SUMMARY**

- 24 A. Section includes fixed, extruded-aluminum louvers.
- 25 B. Related Requirements:
- 26 1. Section 08 11 13 "Hollow Metal Doors and Frames" for louvers in hollow-metal doors.
- 27 2. Section 08 14 16 "Flush Wood Doors" for louvers in flush wood doors.

28 **1.3 ACTION SUBMITTALS**

- 29 A. Product Data: For each type of product.
- 30 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models
- 31 with appropriate AMCA Certified Ratings Seals.
- 32 B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments
- 33 to other work. Show frame profiles and blade profiles, angles, and spacing.
- 34 C. Samples: For each type of metal finish required.

35 **1.4 INFORMATIONAL SUBMITTALS**

- 36 A. Product Test Reports: Based on tests performed according to AMCA 511-L.

37 **PART 2 - PRODUCTS**

38 **2.1 PERFORMANCE REQUIREMENTS**

- 39 A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and
- 40 stresses within limits and under conditions indicated without permanent deformation of louver components,
- 41 noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and
- 42 anchors. Wind pressures shall be considered to act normal to the face of the building.
- 43 1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
- 44 2. Wind Loads: Determine loads based on a uniform pressure acting inward or outward.
- 45 a. Refer to drawings.
- 46 B. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by
- 47 testing manufacturer's stock units identical to those provided, except for length and width according to
- 48 AMCA 511-L.
- 49

1 **2.2 FIXED, EXTRUDED-ALUMINUM DRAINABLE BLADE LOUVERS**

2 A. Drainable Blade Louver (LVR-1):

3 1. Basis-of-Design Product: Subject to compliance with requirements, provide Greenheck Fan
4 Corporation; ESD-202 or comparable product by one of the following:

- 5 a. Airolite Company, LLC (The).
6 b. Industrial Louvers Inc.
7 c. Ruskin Company.

8 B. Fixed-Blade Extruded-Aluminum Louvers: A drainable head member and stationary horizontal blades to
9 channel water to the jambs which guides the water through vertical downspouts for escape at the sill.

10 1. Construction:

- 11 a. Frame: Heavy gauge extruded 6063-T5 aluminum, 2 inches x 0.063 inch nominal wall
12 thickness.
13 b. Blades: Drainable design, heavy gauge extruded 6063-T5 aluminum, 0.063 in. nominal wall
14 thickness, positioned at 45 degree angles on approximately 3 inches centers.
15 c. Construction: Mechanically fastened.
16 d. Birdscreen: 3/4 inch x 0.051 inch flattened expanded aluminum in removable frame, inside
17 mount (rear).
18 e. Minimum Size: 6 inches W x 6 inches H.
19 f. Maximum Single Section Size: 120 inches W or 120 inches H (limited to 70 ft. sq.).

20 2. Louver Performance Ratings:

- 21 a. AMCA Seal: Mark units with AMCA Certified Ratings Seal (Water and Air).
22 b. Free Area: Not less than 6.01 sq. ft. for 48-inch-wide by 48-inch-high louver. 38% of core
23 area.
24 c. Air Performance: Not more than 0.15-inch wg static pressure drop at 1000-fpm free-area
25 velocity.
26 d. Water Penetration: The beginning point of water penetration (0.01 oz. of water (penetration)
27 per sq. ft. of louver free area) shall be above 1058 fpm free area velocity.
28 e. Wind-Driven Rain Performance: Not less than 97 percent effectiveness when subjected to a
29 rainfall rate of 8 inches per hour and a wind speed of 50 mph at a free-area intake velocity
30 of 850 fpm.

31 **2.3 FIXED, FORMED-ALUMINUM LOUVERS**

32 A. Acoustical Louver Sightproof Blade Louver (LVR-2):

33 1. Basis-of-Design Product: Subject to compliance with requirements, provide Greenheck Fan
34 Corporation; AFS-120 or comparable product by one of the following:

- 35 a. Airolite Company, LLC (The).
36 b. Industrial Louvers Inc.
37 c. Ruskin Company.

38 B. Fixed-Blade Formed-Aluminum Louvers: Horizontal Acoustical Weather Louvers as manufactured by
39 Greenheck Fan Corporation.

40 1. Construction:

- 41 a. Frame: Heavy gauge formed aluminum, 12 inches deep. x 0.080 inch nominal wall
42 thickness.
43 b. Blades: Sightproof style, heavy gauge formed aluminum, 0.080 inch nominal wall thickness,
44 positioned at 45 degree on approximately 5 inches centers.
45 c. Construction: Mechanically fastened.
46 d. Acoustical Insulation: Fiberglass Insulation.
47 e. Birdscreen: 3/4 inch x 0.051 flattened expanded aluminum in removable frame, inside
48 mount (rear).
49 f. Minimum Size: 12 inches W x 15 inches H.
50 g. Maximum Single Section Size: 60 inches W x 120 inches H.

51 2. Louver Performance Ratings:

- 52 a. AMCA Seal: Mark units with AMCA Certified Ratings Seal (Water, Sound, Air).
53 b. Sound Transmission Class (ASTM E413): 16.
54 c. Free Area: Not less than 4.27 sq. ft. for 48-inch-wide by 48-inch-high louver. 27% of core
55 area.

- 1 d. Air Performance: Not more than 0.15-inch wg static pressure drop at 900-fpm free-area
2 velocity.
3 e. Water Penetration: The beginning point of water penetration (0.01 oz. of water (penetration)
4 per sq. ft. of louver free area) shall be above 830 fpm free area velocity.

5 **2.4 LOUVER SCREENS**

- 6 A. General: Provide screen at each exterior louver.
7 1. Screen Location for Fixed Louvers: Interior face.
8 2. Screening Type: Bird screening.
9 B. Louver Screen Frames: Same type and form of metal as indicated for louver to which screens are
10 attached.

11 **2.5 MATERIALS**

- 12 A. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise
13 recommended by metal producer for required finish.
14 B. Fasteners: Use types and sizes to suit unit installation conditions.
15 1. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.
16 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
17 3. For color-finished louvers, use fasteners with heads that match color of louvers.
18 C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

19 **2.6 FABRICATION**

- 20 A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for
21 fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
22 B. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, unless
23 otherwise indicated or size of louver assembly makes bolted connections between frame members
24 necessary.

25 **2.7 ALUMINUM FINISHES**

- 26 A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and
27 containing not less than [50] [70] percent PVDF resin by weight in both color coat and clear topcoat.
28 Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin
29 manufacturers' written instructions.
30 1. Color and Gloss: [As indicated by manufacturer's designations] [Match Architect's sample] [As
31 selected by Architect from manufacturer's full range] <Insert color and gloss>.

32 **PART 3 - EXECUTION**

33 **3.1 INSTALLATION**

- 34 A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
35 B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required
36 to protect metal surfaces and to make a weathertight connection.
37 C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
38 D. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or
39 dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by
40 separating surfaces with waterproof gaskets or nonmetallic flashing.

41 **3.2 ADJUSTING**

- 42 A. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If
43 results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace
44 with new units.

45 **END OF SECTION**

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SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

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17 **PART 1 - GENERAL**

18 **1.1 RELATED DOCUMENTS**

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

21 **1.2 SUMMARY**

- 22 A. Section Includes:
23 1. Non-load-bearing steel framing systems for interior partitions (**NSMF**).
24 2. Suspension systems for interior ceilings and soffits.

25 **1.3 ACTION SUBMITTALS**

- 26 A. Product Data: For each type of product.
27 B. Sustainable Design Submittals:
28 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content
29 and cost.

30 **1.4 INFORMATIONAL SUBMITTALS**

- 31 A. Evaluation reports for firestop tracks.

32 **PART 2 - PRODUCTS**

33 **2.1 PERFORMANCE REQUIREMENTS**

- 34 A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-
35 bearing steel framing, provide materials and construction identical to those tested in assembly indicated,
36 according to ASTM E 119 by an independent testing agency.
37 B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those
38 tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an
39 independent testing agency.

40 **2.2 FRAMING SYSTEMS**

- 41 A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer
42 recycled content not less than 35 percent.
43 1. Minimum Recycled Content: 34.9%.
44 2. Minimum Post-Consumer Recycled Content: 24.3%.
45 3. Minimum Pre-Consumer (Post Industrial) Recycled Content: 9.4%.
46

- 1 B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
- 2 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise
- 3 indicated.
- 4 2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40, hot-
- 5 dip galvanized unless otherwise indicated.
- 6 C. Studs and Runners: ASTM C 645.
- 7 1. Steel Studs and Runners:
- 8 a. Minimum Base-Metal Thickness: 0.0179 inch.
- 9 b. Depth: As indicated on Drawings.
- 10 D. Slip-Type Head Joints: Where indicated, provide the following:
- 11 1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to
- 12 interior partition framing resulting from deflection of structure above; in thickness not less than
- 13 indicated for studs and in width to accommodate depth of studs.
- 14 E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement
- 15 of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less
- 16 than indicated for studs and in width to accommodate depth of studs.
- 17 F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
- 18 G. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-
- 19 wide flanges.
- 20 1. Depth: 1-1/2 inches.
- 21 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- 22 H. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of
- 23 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness
- 24 indicated.

25 **2.3 FURRING Refer to Drawings for type and size.**

- 26 A. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
- 27 1. Minimum Base-Metal Thickness: 0.0296 inch.
- 28 2. Depth: As indicated on Drawings.
- 29 B. Resilient Furring Channels (**RISC-1**):
- 30 1. Product: Resilient Sound Isolation Clip Model RSIC-1 as manufactured by PAC International, Inc.
- 31 2. Rubber Isolator:
- 32 a. Natural organic or man-made rubber compounds.
- 33 b. Molded to isolate ferrule from clip.
- 34 c. Minimum of 12 micro-vibration controlling pedestals at point of contact with framing
- 35 member.
- 36 d. Manufactured to ASTM D 2000, M2 AA 510 A13, which includes:
- 37 e. Hardness, ASTM D 2240, Shore A: 45.
- 38 f. Modulus 300 Percent, ASTM D 412, Die C: 5.3 MPa.
- 39 g. Tensile Strength, ASTM D 412, Die C: 11.2 MPa.
- 40 h. Elongation at Break, ASTM D 573: 454 percent.
- 41 3. Clip: Galvanized or aluminum-zinc coated steel, 18 gauge.
- 42 4. Ferrule: Zinc-electroplated steel.
- 43 5. Projection: 1-5/8 inches from supporting structure, when 7/8-inch drywall furring channels are used.
- 44 C. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
- 45 1. Depth: As indicated on Drawings.
- 46 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel
- 47 thickness of 0.0329 inch.
- 48 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or
- 49 double strand of 0.048-inch-diameter wire.
- 50

1 **2.4 SUSPENSION SYSTEMS**

- 2 A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double
3 strand of 0.048-inch-diameter wire.
- 4 B. Hanger Attachments to Concrete:
- 5 1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength
6 design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the
7 design load, as determined by testing per ASTM E 488/E 488M conducted by a qualified testing
8 agency.
- 9 2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated
10 from corrosion-resistant materials, with allowable load capacities calculated according to ICC-
11 ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190
12 conducted by a qualified testing agency.
- 13 C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- 14 D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
- 15 E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and
16 minimum 1/2-inch-wide flanges.
- 17 1. Depth: 2-1/2 inches.
- 18 F. Furring Channels (Furring Members):
- 19 1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges,
20 3/4 inch deep.
- 21 2. Steel Studs and Runners: ASTM C 645.
- 22 a. Minimum Base-Metal Thickness: 0.0269 inch.
- 23 b. Depth: As indicated on Drawings or as required to meet deflection requirements.
- 24 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
- 25 a. Minimum Base-Metal Thickness: 0.0179 inch.
- 26 4. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.
- 27 a. Configuration: Asymmetrical.

28 **2.5 AUXILIARY MATERIALS**

- 29 A. General: Provide auxiliary materials that comply with referenced installation standards.
- 30 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other
31 properties required to fasten steel members to substrates.
- 32 B. Isolation Strip at Exterior Walls: Provide one of the following:
- 33 1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
- 34 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration
35 without foam displacement, 1/8 inch thick, in width to suit steel stud size.

36 **PART 3 - EXECUTION**

37 **3.1 INSTALLATION, GENERAL**

- 38 A. Installation Standard: ASTM C 754.
- 39 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing
40 installation.
- 41 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to
42 framing installation.
- 43 3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to
44 framing installation.
- 45 4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing
46 installation.
- 47 B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- 48 C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars,
49 toilet accessories, furnishings, or similar construction.
- 50 D. Install bracing at terminations in assemblies.
- 51 E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame
52 both sides of joints independently.
- 53

- 1 **3.2 INSTALLING FRAMED ASSEMBLIES**
- 2 A. Install framing system components according to spacings indicated, but not greater than spacings required
- 3 by referenced installation standards for assembly types.
- 4 B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls,
- 5 install isolation strip between studs and exterior wall.
- 6 C. Install studs so flanges within framing system point in same direction.
- 7 D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or
- 8 substrates above suspended ceilings except where partitions are indicated to terminate at suspended
- 9 ceilings. Continue framing around ducts that penetrate partitions above ceiling.
- 10 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce
- 11 joints at tops of framing systems that prevent axial loading of finished assemblies.
- 12 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner
- 13 track section (for cripple studs) at head and secure to jamb studs.
- 14 a. Install two studs at each jamb unless otherwise indicated.
- 15 b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance
- 16 from jamb stud to allow for installation of control joint in finished assembly.
- 17 c. Extend jamb studs through suspended ceilings and attach to underside of overhead
- 18 structure.
- 19 3. Other Framed Openings: Frame openings other than door openings the same as required for door
- 20 openings unless otherwise indicated. Install framing below sills of openings to match framing
- 21 required above door heads.
- 22 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly
- 23 indicated and support closures and to make partitions continuous from floor to underside of solid
- 24 structure.
- 25 a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated
- 26 assembly indicated.
- 27 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- 28 6. Curved Partitions:
- 29 a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
- 30 b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On
- 31 straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.
- 32 E. Direct Furring:
- 33 1. Screw to wood framing.
- 34 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or
- 35 powder-driven fasteners spaced 24 inches o.c.
- 36 F. Z-Shaped Furring Members:
- 37 1. Erect insulation, specified in Section 07 21 00 "Thermal Insulation," vertically and hold in place with
- 38 Z-shaped furring members spaced 24 inches o.c. unless noted otherwise.
- 39 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete
- 40 stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches
- 41 o.c.
- 42 3. At exterior corners, attach wide flange of furring members to wall with short flange extending
- 43 beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of
- 44 attached channel. At interior corners, space second member no more than 12 inches from corner
- 45 and cut insulation to fit.
- 46 G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from
- 47 the plane formed by faces of adjacent framing.
- 48

1 **3.3 INSTALLING SUSPENSION SYSTEMS**

- 2 A. Install suspension system components according to spacings indicated, but not greater than spacings
3 required by referenced installation standards for assembly types.
- 4 B. Isolate suspension systems from building structure where they abut or are penetrated by building structure
5 to prevent transfer of loading imposed by structural movement.
- 6 C. Suspend hangers from building structure as follows:
- 7 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum
8 that are not part of supporting structural or suspension system.
- 9 a. Splay hangers only where required to miss obstructions and offset resulting horizontal
10 forces by bracing, countersplaying, or other equally effective means.
- 11 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that
12 interfere with locations of hangers required to support standard suspension system members,
13 install supplemental suspension members and hangers in the form of trapezes or equivalent
14 devices.
- 15 a. Size supplemental suspension members and hangers to support ceiling loads within
16 performance limits established by referenced installation standards.
- 17 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye
18 screws, or other devices and fasteners that are secure and appropriate for substrate, and in a
19 manner that will not cause hangers to deteriorate or otherwise fail.
- 20 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts,
21 eye screws, or other devices and fasteners that are secure and appropriate for structure and
22 hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
- 23 5. Do not attach hangers to steel roof deck.
- 24 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend
25 through forms.
- 26 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
- 27 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- 28 D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- 29 E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured
30 lengthwise on each member that will receive finishes and transversely between parallel members that will
31 receive finishes.

32 **END OF SECTION**

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SECTION 09 29 00
GYPSUM BOARD

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20 **PART 1 - GENERAL**

21 **1.1 RELATED DOCUMENTS**

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

24 **1.2 SUMMARY**

- 25 A. Section Includes:
- 26 1. Interior gypsum board.
- 27 2. Tile backing panels.

28 **1.3 ACTION SUBMITTALS**

- 29 A. Product Data: For each type of product.
- 30 B. Sustainable Design Submittals:
 - 31 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and
 - 32 cost.
 - 33 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of
 - 34 extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each
 - 35 regional material.
 - 36 3. Product Data: For adhesives and sealants, indicating VOC content.
 - 37 C. Samples: For each texture finish indicated on same backing indicated for Work.

38 **PART 2 - PRODUCTS**

39 **2.1 PERFORMANCE REQUIREMENTS**

- 40 A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction
- 41 identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- 42 B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those
- 43 tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an
- 44 independent testing agency.
- 45

- 1 **2.2 GYPSUM BOARD, GENERAL**
- 2 A. Gypsum board products shall be GREENGUARD Gold Certified.
- 3 B. Regional Materials: Products shall be manufactured within 500 miles of Project site from materials that have
4 been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- 5 C. Size: Provide maximum lengths and widths available that will minimize joints in each area and that
6 correspond with support system indicated.
- 7 **2.3 INTERIOR GYPSUM BOARD (GBD)**
- 8 A. Gypsum Wallboard: ASTM C 1396/C 1396M.
- 9 1. Refer to Wall Types for gypsum wall board type and application.
- 10 B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
- 11 1. Thickness: 5/8 inch.
- 12 2. Long Edges: Tapered.
- 13 3. Acoustical isolation hangers: where applicable for wall designation ___ on the drawings, use the
14 following product in the assembly per the detail drawings: Acoustical Surfaces Inc.: RSIC-1 Resilient
15 Sound Isolation Clips at 16" o.c.
- 16 C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
- 17 1. Thickness: 1/2 inch.
- 18 2. Long Edges: Tapered.
- 19 **2.4 TILE BACKING PANELS (TLBD)**
- 20 A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard
21 edges.
- 22 1. Thickness: 5/8 inch.
- 23 2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- 24 **2.5 TRIM ACCESSORIES**
- 25 A. Interior Trim: ASTM C 1047.
- 26 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-
27 steel sheet.
- 28 2. Shapes:
- 29 a. Cornerbead.
- 30 b. Bullnose bead.
- 31 c. LC-Bead: J-shaped; exposed long flange receives joint compound.
- 32 d. L-Bead: L-shaped; exposed long flange receives joint compound.
- 33 e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
- 34 f. Expansion (control) joint.
- 35 g. Curved-Edge Cornerbead: With notched or flexible flanges
- 36 h. Shadow gap trim mid-panel.
- 37 i. Shadow gap trim at panel edge.
- 38 **2.6 JOINT TREATMENT MATERIALS**
- 39 A. General: Comply with ASTM C 475/C 475M.
- 40 B. Joint Tape:
- 41 1. Interior Gypsum Board: Paper.
- 42 2. Exterior Gypsum Soffit Board: Paper.
- 43 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
- 44 4. Tile Backing Panels: As recommended by panel manufacturer.
- 45 C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other
46 compounds applied on previous or for successive coats.
- 47 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-
48 type taping compound.
- 49 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges,
50 use setting-type taping compound.
- 51 a. Use setting-type compound for installing paper-faced metal trim accessories.
- 52 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
- 53 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
- 54 5. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for
55 application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
- 56

- 1 D. Joint Compound for Exterior Applications:
2 1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping
3 compound.
4 2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.
5 E. Joint Compound for Tile Backing Panels:
6 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
7 2. Cementitious Backer Units: As recommended by backer unit manufacturer.

8 **2.7 AUXILIARY MATERIALS**

- 9 A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's
10 written instructions.
11 B. Polyethylene Vapor Retarders: ASTM D 4397, 6-mil- (0.15-mm-) thick sheet, with maximum permeance
12 rating of 0.1 perm (5.7 ng/Pa x s x sq. m).
13 C. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to
14 continuous substrate.
15 1. Adhesives shall have a VOC content of 50 g/L or less.
16 D. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
17 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112
18 inch thick.
19 2. For fastening cementitious backer units, use screws of type and size recommended by panel
20 manufacturer.
21 E. Sound-Attenuation Blankets (**INSUL-1**): ASTM C 665, Type I (blankets without membrane facing) produced
22 by combining thermosetting resins with mineral fibers manufactured from slag wool, or rock wool.
23 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
24 2. Density: Minimum 2.5 pcf.
25 3. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content
26 not less than 70 percent.
27 4. Indoor Air Quality
28 a. UL Environment certified.
29 b. UL Environment GREENGUARD Gold certified.
30 c. UL Environment validated to be formaldehyde-free.
31 F. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with
32 ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and
33 openings in building construction as demonstrated by testing representative assemblies according to
34 ASTM E 90.
35 1. Sealant shall have a VOC content of 250 g/L or less.
36 G. For backbox putty, select one of the following, including all manufacturer-recommended accessories, in
37 conformance with Division 7 - Sealants:
38 1. SpecSeal SSP Intumescent Putty, Specified Technologies, Inc., Somerville, NJ.
39 2. IsoBacker, Kinetics Noise Products.
40 3. Firestop Putty Pads, Acoustical Solutions.

41 **PART 3 - EXECUTION**

42 **3.1 APPLYING AND FINISHING PANELS**

- 43 A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
44 B. Comply with ASTM C 840.
45 C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide
46 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are
47 exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
48 D. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels.
49 Otherwise, attach trim according to manufacturer's written instructions.
50 E. Prefill open joints, rounded or beveled edges, and damaged surface areas.
51 F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to
52 receive tape.
53

- 1 G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
- 2 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
- 3 2. Level 2: Panels that are substrate for tile.
- 4 3. Level 3: not required.
- 5 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
- 6 a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
- 7 5. Level 5: [not required].
- 8 a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
- 9 H. Cementitious Backer Units: Finish according to manufacturer's written instructions.

10 **3.2 APPLYING TEXTURE FINISHES**

- 11 A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving
- 12 texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- 13 B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform
- 14 texture[matching approved mockup and] free of starved spots or other evidence of thin application or of
- 15 application patterns.

16 **3.3 ACOUSTIC SEPERATION**

- 17 A. Electrical boxes, electrical conduits, pipes, ducts, structure and other penetrations of walls, floors and slabs
- 18 within Acoustically Sensitive Rooms, Electrical Equipment Rooms of all types, Mechanical Equipment
- 19 Rooms of all types and Elevator Equipment Rooms of all types shall be caulked to achieve an airtight and
- 20 light tight closure.
- 21 1. For electrical boxes, audio and video panels, fire extinguisher cabinets, HVAC system control
- 22 devices, and similar elements recessed into acoustically-sensitive partitions or where backboxes
- 23 serving adjacent rooms but located in the same partition within the same stud space, wrap entire
- 24 concealed surface with putty to form airtight, light-tight closure of the entire surface of the backbox
- 25 extending to and bonding with the back face of the adjacent gypsum board or other wall cladding.
- 26 Install in compliance with manufacturer's recommendations.
- 27 2. Provide intumescent putty at fire rated wall assemblies. Refer to Section 07 84 43 – Joint
- 28 Firestopping.

29 **3.4 PROTECTION**

- 30 A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other
- 31 causes during remainder of the construction period.
- 32 B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

33 **END OF SECTION**

SECTION 09 30 13

CERAMIC TILING

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Porcelain wall tile (TL-#).
 - 2. Porcelain floor tile (TLFL-#).
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required.

1.5 INFORMATIONAL SUBMITTALS

- A. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
- B. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a mockup submittal for review.
 - 1. Mock-up: floor tile TLFL-2 at Level 1 public lobby to match existing floor tile and grout. Minimum floor mock-up area of 4 feet x 4 feet.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- 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.

2.3 TILE PRODUCTS

- A. Ceramic Tile Type:
 - 1. Certification: Porcelain tile certified by the Porcelain Tile Certification Agency.
 - 2. Floor Tile: Dynamic Coefficient of Friction: Not less than 0.42.
- B. Wall Tile (Bathrooms):
 - 1. Wall Tile (TL-1):
 - a. Manufacturer: Fireclay Tile.
 - b. Recycled clay body.
 - c. Style: Arable.
 - d. Size: 8 inches by 8 inches.
 - e. Edge: Rectified.
 - f. Color: Custom - Spruce, Hunter, Limon, Carbon.

2. Wall Tile (**TL-2**):
 - a. Ceramic Tile (OFCI).
 - b. 4 inches X4 inches.
3. Wall Base (**TL-3**):
 - a. Ceramic Tile Wall Base (OFCI).
 - b. 4 inches x 6 inches Cove Base.
- C. Floor Tile (Bathrooms): Unglazed porcelain tile.
 1. Mosa porcelain tiles greater than 12 inches x 12 inches shall not be installed on fresh mortar beds.
 2. For thin-bed installations, new concrete surfaces shall be wood-floated or broom-finished. In addition, surfaces shall be level and true to a tolerance of +1/8 inch (3 mm.) in 10 feet (3 m.) for floors.
 3. For correction of floor levelness, if required, use a cementitious self-leveling underlayment.
 4. Tile (TLFL-1):
 - a. Manufacturer: MOSA.
 - b. Style: Selection One.
 - c. Size: 12 inches X 24 inches.
 - d. Color: 1104 V.
 5. Tile (TLFL-2):
 - a. Type: Quarry
 - b. Manufacturer: American Olean
 - c. Color Shadow Grey N46
 - d. Size: 8 inches X 8 inches.

2.4 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, selected from the following that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
 1. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
 2. Latex-Portland Cement Waterproof Mortar: Flexible, waterproof mortar consisting of cement-based mix and latex additive.

2.5 SETTING MATERIALS

- A. Self-leveling Cementitious Underlayment: ASTM C627.
- B. Latex-Portland Cement Mortar (Thinset): ANSI A118.4.
 1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.

2.6 GROUT MATERIALS

- A. High-Performance Tile Grout: ANSI A118.7.
 1. Polymer Type (Walls): Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
- B. Water-Cleanable Epoxy Grout (Floors): ANSI A118.3, with a VOC content of 65 g/L or less.

2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- C. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.8 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 bonded mortar bed 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.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 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. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Porcelain Tile: 1/4 inch.
- F. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.5 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. 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.

3.6 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations with Radiant Heat, Concrete Subfloor – On-Ground:
 - 1. Ceramic Tile Installation: TCNA RH110-17; thinset mortar; epoxy grout.
 - a. Ceramic Tile Type: **TLFL-1**.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: Water-cleanable epoxy grout.
 - d. Floor leveling: TCNA F205; cementitious self-leveling underlayment, thinset mortar; epoxy grout.
- B. Interior Floor Installations with Radiant Heat, Concrete Subfloor – Above-Ground:
 - 1. Ceramic Tile Installation: TCNA RH110A-17; thinset mortar; epoxy grout.
 - a. Ceramic Tile Type: **TLFL-1**.
 - b. Membrane: Waterproof membrane. Return to wallboard and apply sealant at floor/wall joint.
 - c. Thinset Mortar: Modified dry-set mortar.
 - d. Grout: Water-cleanable epoxy grout.
 - e. Floor leveling: TCNA F205A; cementitious self-leveling underlayment, membrane thinset mortar; epoxy grout.
- C. Interior Floor Installation, Concrete Subfloor – On Ground
 - 1. Ceramic Tile Installation: TCNA F132-17; bonded mortar bed; epoxy grout.
 - a. Ceramic Tile Type: **TLFL-2**.
 - b. Bond Coat: Epoxy mortar.
 - c. Grout: Water-cleanable epoxy grout.
- D. Interior Wall Installation:
 - 1. Ceramic Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units.
 - a. Ceramic Tile Type: **TL-#**.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: Water-cleanable epoxy grout.

END OF SECTION 09 30 13

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SECTION 09 51 13
ACOUSTICAL PANEL CEILINGS

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27 **PART 1 - GENERAL**

28 **1.1 RELATED DOCUMENTS**

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

31 **1.2 SUMMARY**

- 32 A. Section includes acoustical panels and exposed suspension systems for interior ceilings (**ACCL-1**).

33 **1.3 PREINSTALLATION MEETINGS**

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

35 **1.4 ACTION SUBMITTALS**

- 36 A. Product Data: For each type of product.
37 B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
38 C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on
39 Samples of sizes indicated below:
40 1. Acoustical Panels: Set of full-size Samples of each type, color, pattern, and texture.
41 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each
42 type, finish, and color.

43 **1.5 SUSTAINABLE MATERIALS**

- 44 A. Transparency: Manufacturers will be given preference when they provide documentation to support
45 sustainable requirements for the following: Material ingredient transparency, Removal of Red List
46 Ingredients per LBCV3, Life Cycle impact information, Low-Emitting Materials, and Clean Air performance.
47 1. Health Product Declaration. The end use product has a published, complete Health Product
48 Declaration with disclosure at a minimum of 1000ppm of known hazards in compliance with the
49 Health Product Declaration open Standard.
50 2. Declare Label. The end use product has a published Declare label by the International Living
51 Future Institute with disclosure of 100 ppm with a designation of Red List Free or Compliant (less
52 than 1% proprietary ingredients).
53 3. Low Emitting products with VOC emissions data. Preference will also be given to manufacturers

- 1 that can provide emissions data showing their products meet CDHP Standard Method v1.1.
2 4. Life cycle analysis. Products that have communicated lifecycle data through Environmental Product
3 Declarations (EPDs) will be preferred.
4 5. End of Life Programs/Recycling: Where applicable, manufacturers that provide the option for
5 recycling of their products into new products at end-of-life through take-back programs will be
6 preferred.

7 **1.6 INFORMATIONAL SUBMITTALS**

- 8 A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown
9 and coordinated with each other, using input from installers of the items involved:
10 1. Ceiling suspension-system members.
11 2. Structural members to which suspension systems will be attached.
12 3. Method of attaching hangers to building structure.
13 a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose
14 installation is specified in other Sections.
15 4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do
16 not permit installation of hanger wires at required spacing.
17 5. Size and location of initial access modules for acoustical panels.
18 6. Items penetrating finished ceiling and ceiling-mounted items including the following:
19 a. Lighting fixtures.
20 b. Diffusers.
21 c. Grilles.
22 d. Speakers.
23 e. Sprinklers.
24 f. Access panels.
25 g. Perimeter moldings.
26 7. Minimum Drawing Scale: 1/8 inch = 1 foot.
27 B. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and
28 witnessed by a qualified testing agency.

29 **1.7 CLOSEOUT SUBMITTALS**

- 30 A. Maintenance Data: For finishes to include in maintenance manuals.

31 **1.8 MAINTENANCE MATERIAL SUBMITTALS**

- 32 A. Furnish extra materials, from the same product run, that match products installed and that are packaged
33 with protective covering for storage and identified with labels describing contents.
34 1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed in unopened
35 packing.
36 2. Open packages, trimmed pieces greater than a half tile.

37 **1.9 DELIVERY, STORAGE, AND HANDLING**

- 38 A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them
39 in a fully enclosed, conditioned space where they will be protected against damage from moisture,
40 humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
41 B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture
42 content.

43 **1.10 FIELD CONDITIONS**

- 44 A. Environmental Limitations: Do not install acoustical panel ceilings until wet-work in spaces is complete and
45 dry, work above ceilings is complete.
46

1 **1.11 WARRANTY**

- 2 A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace
3 panels that fail within the warranty period. Failures include, but are not limited to the following:
4 1. Acoustical Panels: Sagging and warping.
5 2. Grid System: Rusting and manufacturer's defects.
6 B. Warranty Period:
7 1. Acoustical panels: Ten (10) years from date of substantial completion.
8 2. Suspension: Ten (10) years from date of substantial completion.
9 3. Ceiling System: Thirty (30) years from date of substantial completion.

10 **PART 2 - PRODUCTS**

11 **2.1 MANUFACTURERS**

- 12 A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that
13 may be incorporated into the Work include, but are not limited to the following:
14 1. Armstrong World Industries, Inc.
15 2. CertainTeed Corporation.
16 3. United States Gypsum Company.
17 B. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system
18 from single source from single manufacturer.

19 **2.2 PERFORMANCE REQUIREMENTS**

- 20 A. Ceiling products shall comply with the requirements of the California Department of Public Health's
21 "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor
22 Sources Using Environmental Chambers."
23 B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify
24 products with appropriate markings of applicable testing agency.
25 1. Flame-Spread Index: Class A according to ASTM E 1264.
26 2. Smoke-Developed Index: 450 or less.

27 **2.3 ACOUSTICAL PANELS (ACCL-#)**

- 28 A. Basis of Design: OPTIMA Plant Based, 3256PB No added formaldehyde as manufactured by Armstrong
29 World Industries.
30 1. Surface Texture: Fine.
31 2. Composition: Fiberglass.
32 3. Color: White.
33 4. **ACCL-1** Size: 24 inches x 24 inches.
34 5. **ACCL-2** Size: 24 inches x 60 inches.
35 6. Edge Profile: Square Tegular 9/16 inch.
36 7. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton 0.95.
37 8. Ceiling Attenuation Class (CAC) Sabin: N/A.
38 9. Articulation Class (AC): ASTM E 1111; Classified with UL label on product carton 190.
39 10. Flame Spread: ASTM E 1264; Class A (UL).
40 11. Light Reflectance (LR) White Panel: ASTM E 1477; 0.90.
41 12. Dimensional Stability: HumiGuard Plus.
42 13. Recycle Content: Post-Consumer - 12% Pre-Consumer - 59%.
43 14. Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label.
44 15. Life Cycle Assessment: Third Party Certified Environment Product Declaration (EPD).
45 16. Classification: Class A.
46 17. Thickness: 1 inch (25 mm).
47 18. Suspension System: Narrow faced suspension system.

48 **2.4 METAL SUSPENSION SYSTEM**

- 49 A. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension
50 system and accessories according to ASTM C 635/C 635M and designated by type, structural
51 classification, and finish indicated.
52 B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less

- 1 than 25 percent.
- 2 C. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from
- 3 cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating
- 4 designation; with prefinished 9/16-inch-wide metal caps on flanges.
- 5 1. Structural Classification: Intermediate-duty system.
- 6 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
- 7 3. Face Design: Flat, flush.
- 8 4. Cap Material: Cold-rolled steel.
- 9 5. Cap Finish: Painted white.

10 **2.5 ACCESSORIES**

- 11 A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct
- 12 Hung," unless otherwise indicated. Comply with seismic design requirements.
- 13 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for
- 14 attaching hangers of type indicated and with capability to sustain, without failure, a load equal to
- 15 five times that imposed by ceiling construction, as determined by testing according to
- 16 ASTM E 488/E 488M or ASTM E 1512 as applicable, conducted by a qualified testing and
- 17 inspecting agency.
- 18 a. Type: Postinstalled bonded anchors.
- 19 b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B 633,
- 20 Class SC 1 (mild) service condition.
- 21 B. Wire Hangers, Braces, and Ties: Provide wires as follows:
- 22 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
- 23 2. Size: Wire diameter sufficient for its stress at three times hanger design load
- 24 (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less
- 25 than 0.106-inch- diameter wire.
- 26 C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- 27 D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- 28 E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized-steel
- 29 sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-
- 30 inch-diameter bolts.

31 **2.6 METAL EDGE MOLDINGS AND TRIM**

- 32 A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated,
- 33 manufacturer's standard moldings for edges and penetrations that comply with seismic design
- 34 requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges
- 35 of suspension-system runners.
- 36 1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match
- 37 width and configuration of exposed runners unless otherwise indicated.
- 38 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same
- 39 depth and width as that formed between edge of panel and flange at exposed suspension member.
- 40 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit
- 41 penetration exactly.

42 **2.7 ACOUSTICAL SEALANT**

- 43 A. Acoustical Sealant: As specified in Section 07 92 19 "Acoustical Joint Sealants."

44 **PART 3 - EXECUTION**

45 **3.1 EXAMINATION**

- 46 A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings
- 47 attach or abut, with Installer present, for compliance with requirements specified in this and other Sections
- 48 that affect ceiling installation and anchorage and with requirements for installation tolerances and other
- 49 conditions affecting performance of acoustical panel ceilings.
- 50 B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or
- 51 mold damaged.
- 52 C. Proceed with installation only after unsatisfactory conditions have been corrected.
- 53

- 1 **3.2 PREPARATION**
- 2 A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite
- 3 edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and
- 4 comply with layout shown on reflected ceiling plans.
- 5 B. Layout openings for penetrations centered on the penetrating items.
- 6 **3.3 INSTALLATION**
- 7 A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
- 8 B. Suspend ceiling hangers from building's structural members and as follows:
- 9 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum
- 10 that are not part of supporting structure or of ceiling suspension system.
- 11 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by
- 12 bracing, countersplaying, or other equally effective means.
- 13 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that
- 14 interfere with location of hangers at spacings required to support standard suspension-system
- 15 members, install supplemental suspension members and hangers in form of trapezes or equivalent
- 16 devices.
- 17 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of
- 18 three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices
- 19 that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to
- 20 age, corrosion, or elevated temperatures.
- 21 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members,
- 22 by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the
- 23 structure to which hangers are attached and the type of hanger involved. Install hangers in a
- 24 manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated
- 25 temperatures.
- 26 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying
- 27 channels or other supplemental support for attachment of hanger wires.
- 28 7. Space hangers not more than 48 inches o.c. along each member supported directly from hangers
- 29 unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
- 30 8. Size supplemental suspension members and hangers to support ceiling loads within performance
- 31 limits established by referenced standards.
- 32 C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where
- 33 necessary to conceal edges of acoustical panels.
- 34 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings
- 35 before they are installed.
- 36 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3
- 37 inches from ends. Miter corners accurately and connect securely.
- 38 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- 39 D. Install suspension-system runners so they are square and securely interlocked with one another. Remove
- 40 and replace dented, bent, or kinked members.
- 41 E. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and
- 42 edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
- 43 1. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm
- 44 contact with top surface of runner flanges.
- 45 2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel
- 46 surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
- 47 **3.4 ERECTION TOLERANCES**
- 48 A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-
- 49 cumulative.
- 50 B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a
- 51 tolerance of 1/8 inch in 12 feet, non-cumulative.
- 52

- 1 **3.5 CLEANING**
2 A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-
3 system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish
4 damage.
5 B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently
6 eliminate evidence of damage.

7 **END OF SECTION**

SECTION 09 54 26
ACOUSTICAL WOOD CEILINGS

PART 1 – GENERAL

- [1.1 RELATED DOCUMENTS](#)
- [1.2 SUMMARY](#)
- [1.3 SUBMITTALS](#)
- [1.4 QUALITY ASSURANCE](#)
- [1.5 REFERENCES](#)
- [1.6 DELIVERY, STORAGE AND HANDLING](#)
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PART 2 – PRODUCTS

- [2.1 MANUFACTURER](#)
- [2.2 WOOD CEILING STRIPS \(WDCL-1\)](#)

PART 3 – EXECUTION

- [3.1 EXAMINATION](#)
- [3.2 INSTALLATION](#)
- [3.3 ADJUSTING AND CLEANING](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general conditions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections apply to the work of this section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Suspension clip-rail system with attached clips, and linear wood strips **(WDCL-1)**.
- B. Related Sections
 - 1. Section 06 20 23 –Interior Finish Carpentry
 - 2. Division 23 – Mechanical Diffusers, vents and other mechanical items
 - 3. Division 26 – Electrical lights and other ceiling mounted electrical items

1.3 SUBMITTALS

- A. Comply with Section 01 33 00 – Submittal Procedures
- B. Product Data: Manufacturer's technical data and installation instructions for ceiling panels required.
- C. Certifications: Certified test reports showing compliance with performance requirements specified.
- D. Samples: Submit a minimum of three samples of each panel type and veneer type required. Include samples that show the range of variation expected in grain, texture and color.
- E. Shop drawings: Submit shop drawings showing overall layout with dimensions and details of penetrations and intersections with other materials or building components.
- F. LEED requirements: Where specified submit required documentation indicating compliance.
- G. Submit operation and maintenance data for installed products. Include precautions relating to harmful cleaning materials and methods that would affect the service life of the panels.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide wood veneer ceiling panels from a single Manufacturer with at least 2 years prior experience fabricating projects of similar size and complexity.
- B. Installer: Installation shall be done by qualified Carpenters experienced in the installation of architectural wood work. Installers shall receive training on handling, cutting, machining and field finishing the specified product prior to receiving materials on site.
- C. Fire Performance Characteristics: Class A as tested by an independent accredited testing facility.
Tests: ASTM E84. Flame spread: 25 or less. Smoke developed: 450 or less as specified by State or local codes.

- D. Applicable LEED Credits:
 - 1. EA 1 Optimized Energy Performance.
 - 2. MR 4.1, 4.2 Recycled Content.
 - 3. MR 6 Rapidly Renewable Materials.
 - 4. EQ 4.4 Low-Emitting Materials.
 - 5. MR 5.1 Use of Regional Materials.
 - 6. MR 7 Use of FSC material.
 - 7. EQ 7 & 7.1 Thermal Comfort.
 - 8. EQ 9 Enhanced acoustical performance.
- E. Coordination of Work: Installing contractor shall organize and conduct a pre-installation survey of temperature, humidity and construction elements attaching, penetrating or concealed behind the wood veneer ceiling panels.
- F. Wood veneer panels to be manufactured from no less than 75 percent post industrial recycled materials by weight.
- G. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a mockup submittal for review.
 - 1. Finish Mock-up: A finish mock-up of the ceiling panel. Level 1 classroom: one full width panel between glulam beams.

1.5 REFERENCES

- A. Test Methods:
 - 1. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method performed by an independent testing agency.
 - 2. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
 - 3. ASTM E 90 Standard Test Method for Measurement of Airborne Sound Transmission Loss

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver panels to the project in original, unopened packages. Inspect containers for visible damage and report any questionable condition to the shipper and manufacturer immediately.
- B. Store products in a fully enclosed, clean, dry space out of direct sunlight and protected from damage with temperature controlled between 50 and 86 degrees F.
- C. Handle products carefully to avoid damaging panel surfaces or chipping edges. Report any damage immediately. Installation of damaged panels is not covered by the manufacturers warranty.

1.7 PROJECT CONDITIONS

- A. Do not install wood veneer ceiling panels until space is enclosed and weather proofed, wet work is completely dry, and ambient temperature and humidity conditions are maintained at the levels indicated for the project when occupied for its intended use.
- B. Permit panels to reach room temperature, 50 to 86 degrees F, and stabilized moisture content of 25% to 55% RH for at least 72 hours before installation per AWI standards. Building should be enclosed and HVAC systems functioning in continuous operation with relative humidity maintained between 25 and 55 percent.

1.8 WARRANTY

- A. Provide manufacturer's standard one year written product warranty per Section 01 77 00 – Closeout Procedures Manufacturer's warranty is limited to decorative or acoustical panel materials only.

1.9 MAINTENANCE

- A. Extra Materials
 - 1. Deliver no less than 1 carton of each type, color and pattern of material.
 - 2. Extra materials shall be from the same production run as the original materials.
 - 3. Extra materials shall remain in the manufacturer's original unopened packaging and stored in a fully enclosed, clean, dry space out of direct sunlight and protected from damage with temperature controlled between 50 degrees F and 86 degrees F.
 - 4. Provide extra clips and hangers.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: Armstrong Woodworks Grille. Finish – Maple."
 - 1. Comparable product approved in advance by Rulon International Inc.
- B. System Description:
 - 1. Panel Type: 7266BO.
 - 2. Slat Size: 5/8 inch x 2-1/4 inches.
 - 3. Slats Per Panel: 8.
 - 4. Panel Size: 12 inches W x 2-3/4 inches H.
 - 5. Panel Length: Custom, See Drawings.
 - 6. Finish: Grille Maple.
 - 7. Grid: Heavy-Duty Classification (Armstrong Prelude XL).
 - 8. Grid Color: Black.
 - 9. Infill Product: BioAcoustic 5823 as manufactured by Armstrong Ceilings. Color: Black (Matte).

2.2 WOOD CEILING STRIPS (WDCL-1)

- A. Wood Strips:
 - 1. Linear Wood Strips shall be made from prime grade, all-natural wood with a shop factory finish. They shall be manufactured in random lengths with tongue-and-groove ends, or in nominal fixed lengths depending on area dimensions.
 - 2. Wood is a natural product that will undergo changes with variations in the environment. Therefore, all dimension tolerances are $\pm 1/8"$ (3mm).
- B. Suspension Systems:
 - 1. The suspension system shall consist of heavy-duty acoustical panel suspension system, installed on #12-gauge wire hangers.
- C. Edges, Borders, And Perimeter Trims:
 - 1. Edges, borders, and perimeter trims shall be designated by specifier in accordance with standard design details available. All wood ceiling products specified shall be supplied by the ceiling manufacturer.
- D. Access Panels: Manufacturer's shall provide concealed access panels as indicated on the Reflected Ceiling Plan and as required to access mechanical and electrical controls, valves and filters.
- E. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from 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 50 percent.
- F. Finishes and Colors:
 - 1. All Linear Wood Strips shall be factory-finished with clear sealers, wood stains, or semi-transparent color treatments as selected. All finishes shall be selected by the designer, architect, or designated owner's representative.
 - 2. Wood is a natural product with variations in grain, texture, and color - often ranging from light to dark - thereby, affecting the surface look. Product finishes are stain or sealer coats, spray-applied to a smooth-sanded surface.
- G. Wood Strips:
 - 1. Species: Maple.
 - 2. Cut: Plain sliced.
 - 3. Matching between strips: No sequencing.
 - 4. Finish: As selected by Architect from manufacturer's offerings.
- H. Infill
 - 1. ASTM Classification: Type: XX, Form: 3, Pattern: E.
 - 2. Sound Absorption (NRC): 0.75.
 - 3. Fire Performance: Class A.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Inspect installation area and conditions under which work is to be performed for compliance with all manufacturers' environmental requirements. All wet work in the installation area shall be complete, cured and dry prior to installation. Do not proceed until all unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Installation shall be done by qualified carpenters experienced in the installation of architectural woodwork. The firm shall demonstrate successful experience installing materials of similar type and quality of those required for this project. The use of proper carpentry tools and techniques will be required for the installation.
- B. Comply with manufacturer's instruction and recommendations for installation of ceiling panels consistent with industry standards.
- C. Perimeters: Using a leveling device, the contractor shall lay out and install perimeter trim, as specified.
- D. Confirm all field dimensions are coordinated with shop drawings.
- E. Coordinate the exact size, location and sequencing of panels including penetrations by all building components.
- F. Lay out ceiling panels per approved shop drawings. Report any interferences or deviations before proceeding.
- G. Suspensions: Install suspension systems to comply with appropriate industry standards. . #12-Gauge Wire hangers shall be installed 4 feet (1219mm) on center, along each rail. The wire hangers shall be attached to inserts, screw eyes, or other connecting devices that are secure and appropriate for suspending the ceiling and that will not deteriorate or fail with age or elevated temperatures.
- H. Wood Strip Installation: as required by manufacturer.
- I. HVAC and Light Fixture Suspensions: Electrical and mechanical installations must be supported independently of the linear wood ceiling

3.3 ADJUSTING AND CLEANING

- A. Clean soiled surfaces of ceiling panels per manufacturer's instructions.
- B. Remove and replace damaged, discolored or materials not in compliance with manufacture's tolerances.
- C. Adjust panels after installation so that surfaces are all aligned with gaps or reveals between units straight and consistent in width.

END OF SECTION

SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

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3 PART 1 – GENERAL
4 1.1 [RELATED DOCUMENTS](#)
5 1.2 [SUMMARY](#)
6 1.3 [ACTION SUBMITTALS](#)
7 PART 2 – PRODUCTS
8 2.1 [PERFORMANCE REQUIREMENTS](#)
9 2.2 [THERMOSET-RUBBER BASE \(WB-1\)](#)
10 2.3 [INSTALLATION MATERIALS](#)
11 PART 3 – EXECUTION
12 3.1 [PREPARATION](#)
13 3.2 [RESILIENT BASE INSTALLATION](#)
14 3.4 [CLEANING AND PROTECTION](#)

15 **PART 1 - GENERAL**

16 **1.1 RELATED DOCUMENTS**

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

19 **1.2 SUMMARY**

- 20 A. Section Includes:
21 1. Resilient base.

22 **1.3 ACTION SUBMITTALS**

- 23 A. Product Data: For each type of product.
24 B. Sustainable Design Submittals:
25 1. Product Data: For adhesives, indicating VOC content.
26 C. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

27 **PART 2 - PRODUCTS**

28 **2.1 PERFORMANCE REQUIREMENTS**

29 **2.2 THERMOSET-RUBBER BASE (WB-1)**

- 30 A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that
31 may be incorporated into the Work include, but are not limited to, the following:
32 1. Johnsonite; A Tarkett Company.
33 B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
34 1. Style and Location:
35 a. Style A, Straight: Provide in areas with carpet and resilient flooring.
36 C. Thickness: 0.125 inch.
37 D. Height: 4 inches.
38 E. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.
39 F. Outside Corners: Job formed or preformed.
40 G. Inside Corners: Job formed or preformed.
41 H. Colors: 63 Burnt Umber
42

- 1 **2.3 INSTALLATION MATERIALS**
2 A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended
3 hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for
4 applications indicated.
5 B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and
6 substrate conditions indicated.
7 1. Adhesives shall have a VOC content of 50] g/L or less and 60 g/L or less for rubber stair treads.
8 C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to
9 fill nosing substrates that do not conform to tread contours.
10 D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread
11 manufacturer.

12 **PART 3 - EXECUTION**

- 13 **3.1 PREPARATION**
14 A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient
15 products.
16 B. Do not install resilient products until they are the same temperature as the space where they are to be
17 installed.

- 18 **3.2 RESILIENT BASE INSTALLATION**
19 A. Comply with manufacturer's written instructions for installing resilient base.
20 B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other
21 permanent fixtures in rooms and areas where base is required.
22 C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces
23 aligned.
24 D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact
25 with horizontal and vertical substrates.
26 E. Do not stretch resilient base during installation.
27 F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with
28 manufacturer's recommended adhesive filler material.
29 G. Preformed Outside Corners: Install preformed corners before installing straight pieces.
30 H. Job-Formed Corners:
31 1. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less
32 than 3 inches in length.
33 a. Miter or cope corners to minimize open joints.

- 34 **3.3 CLEANING AND PROTECTION**
35 A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
36 B. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before
37 applying liquid floor polish.
38 1. Apply two coat(s).
39 C. Cover resilient products subject to wear and foot traffic until Substantial Completion.

40 **END OF SECTION**

SECTION 09 68 13
TILE CARPETING

- 1
- 2
- 3 PART 1 – GENERAL
- 4 [1.1 RELATED DOCUMENTS](#)
- 5 [1.2 SUMMARY](#)
- 6 [1.3 PREINSTALLATION MEETINGS](#)
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- 11 [1.8 ATTIC STOCK SUBMITTALS](#)
- 12 [1.9 WARRANTY](#)
- 13 PART 2 – PRODUCTS
- 14 [2.1 CARPET TILE \(CPT-1\)](#)
- 15 [2.2 INSTALLATION ACCESSORIES](#)
- 16 PART 3 – EXECUTION
- 17 [3.2 PREPARATION](#)
- 18 [3.3 INSTALLATION](#)

19 **PART 1 - GENERAL**

20 **1.1 RELATED DOCUMENTS**

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

23 **1.2 SUMMARY**

- 24 A. Section includes modular carpet tile.

25 **1.3 PREINSTALLATION MEETINGS**

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

27 **1.4 ACTION SUBMITTALS**

- 28 A. Product Data: For each type of product.
- 29 B. Sustainable Design Submittals:
- 30 1. MR Credit 2: Building Product Disclosure and Optimization - Environmental Product Declarations
 - 31 2. MR Credit 3: Building Product Disclosure and Optimization - Sourcing of Raw Materials
 - 32 3. MR Credit 4: Building Product Disclosure and Optimization - Material Ingredients
 - 33 4. MR Credit 5: Construction and Demolition Waste Management
 - 34 5. EQ Credit 1: Enhanced Indoor Air Quality Strategies
 - 35 6. EQ Credit 2: Low-Emitting Materials: Adhesives & Sealants
 - 36 7. EQ Credit 2: Low-Emitting Materials: Flooring Systems
 - 37 8. ID Credit 1.2 Innovation in Design (ANSI/NSF-140)
 - 38 9. Living Building Challenge:
 - 39 10. WELL Building Standard:
- 40 C. Shop Drawings: For carpet tile installation, plans showing the following:
- 41 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are
42 required in carpet tiles.
 - 43 2. Carpet tile type, color, and dye lot.
 - 44 3. Type of subfloor.
 - 45 4. Type of installation.
 - 46 5. Pattern of installation.
 - 47 6. Pattern type, location, and direction.
 - 48 7. Pile direction.
 - 49 8. Type, color, and location of insets and borders.
 - 50 9. Type, color, and location of edge, transition, and other accessory strips.
 - 51 10. Transition details to other flooring materials.
- 52 D. Samples: For each exposed product and for each color and texture required.
- 53

- 1 **1.5 INFORMATIONAL SUBMITTALS**
2 A. Product test reports.
3 B. Sample warranty.
- 4 **1.6 CLOSEOUT SUBMITTALS**
5 A. Maintenance data.
- 6 **1.7 QUALITY ASSURANCE**
7 A. Installer Qualifications: Certified by the International Certified Floorcovering Installers Association at the
8 Commercial II certification level.
- 9 **1.8 ATTIC STOCK SUBMITTALS**
10 A. Furnish extra materials, from the same product run, that match products installed and that are packaged
11 with protective covering for storage and identified with labels describing contents.
12 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not
13 less than 10 sq. yd..
- 14 **1.9 WARRANTY**
15 A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile
16 installation that fail in materials or workmanship within specified warranty period.
17 1. Warranty Period: 10 years from date of Substantial Completion.

18 **PART 2 - PRODUCTS**

- 19 **2.1 CARPET TILE (CPT-#)**
20 A. Refer to Material Products List for color/pattern schedule.
21 B. Mohawk Lichen Series:
22 1. Product Type: Tile
23 2. Construction: Tufted
24 3. Minimum Sq. Yd.: No Minimum
25 4. Surface Texture: Textured Patterned Loop
26 5. Gauge: 1/12 (47.00 rows per 10 cm)
27 6. Density: 11,423
28 7. Weight Density: 376,961
29 8. Stitches Per Inch: 12.6 (49.61 per 10 cm)
30 9. Finished Pile Thickness: .104 inch (2.64 mm)
31 10. Dye Method: Solution Dyed
32 11. Backing Material: EcoFlex NXT
33 12. Fiber Type: Duracolor® Premium Nylon
34 13. Face Weight: 33 oz/yd2 (1119 g/m2)
35 14. Pattern Repeat: Not Applicable
36 15. Size: 12 inches x 36 inches (.3048 m x .9144 m).
37 16. Soil Release Technology: Sentry Soil Protection
38 17. GSA Stain Release Rating: Pass
39 18. Foot Traffic Recommendation TARR: Heavy
40 19. Sustainability:
41 a. IAQ Green Label Plus: Green Label Plus 1171
42 b. Pre-Consumer Recycled Content: 56%
43 c. Post-Consumer Recycled Content: 1%
44 d. NSF 140: Gold
45 e. Declare Label: Declared Red List Free
46 20. Performance:
47 a. Static: AATCC-134 Under 3.5 KV
48 b. Flammability: ASTM E 648 Class 1 (Glue Down)
49 c. Smoke Density: ASTM E 662 Less than 450
50 21. Certifications/Labels/Declarations:
51 a. Red List Free: Yes.
52 b. CDPH v1.1-2010 Compliant: Yes.
53 c. Living Building Challenge (LBC) Declaration: LBC Red List Free.

- 1 d. Indoor Air Quality: GLP1171.
- 2 e. NSF 140 Certification: EcoFlex NXT Gold.
- 3 f. Declare Label: Declare Label - EcoFlex NXT - LBC Red List Free.
- 4 g. Environmental Product Declaration: EPD EcoFlex NXT.
- 5 h. Health Product Declaration: HPD 2.0 EcoFlex NXT Gold.
- 6 i. Environmental Claims Declaration: UL - Recycled Content - EcoFlex NXT Gold.
- 7 22. Warranties: Lifetime Limited Carpet Tile Warranty, Lifetime Duracolor Stain Warranty, Lifetime
- 8 Static.

- 9 **2.2 INSTALLATION ACCESSORIES**
- 10 A. Carpet Accessory: Refer to Drawings.

11 **PART 3 - EXECUTION**

12 **3.1 PREPARATION**

- 13 A. General: Comply with CRI's "CRI Carpet Installation Standards" and with carpet tile manufacturer's written
- 14 installation instructions for preparing substrates indicated to receive carpet tile.

15 **3.2 INSTALLATION**

- 16 A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with
- 17 carpet tile manufacturer's written installation instructions.
- 18 B. Installation Method: As recommended in writing by carpet tile manufacturer.
- 19 C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- 20 D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.
- 21 E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including
- 22 cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by
- 23 carpet tile manufacturer.
- 24 F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges,
- 25 alcoves, and similar openings.
- 26 G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating
- 27 on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- 28 H. Install pattern parallel to walls and borders.
- 29 I. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid.
- 30 Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.
- 31 J. Protect carpet tile against damage from construction operations and placement of equipment and fixtures
- 32 during the remainder of construction period. Use protection methods indicated or recommended in writing
- 33 by carpet tile manufacturer.

34 **END OF SECTION**

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SECTION 09 69 00

ACCESS FLOORING

PART 1 – GENERAL

- [1.1 RELATED DOCUMENTS](#)
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PART 2 – PRODUCTS

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- [2.3 FLOOR PANELS](#)
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PART 3 – EXECUTION

- [3.1 EXAMINATION](#)
- [3.2 PREPARATION](#)
- [3.3 INSTALLATION](#)
- [3.4 PROTECTION](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Access Flooring (**AXFL-#**)
 - 1. Access-flooring panels.
 - 2. Understructure.
- B. Related Requirements:
 - 1. Section 26 05 26 "Grounding and Bonding for Electrical Systems" for connection to ground of access-flooring understructure.

1.3 COORDINATION

- A. Coordinate location of mechanical and electrical work in underfloor cavity to prevent interference with access-flooring pedestals.
- B. Mark pedestal locations on subfloor using a grid to enable mechanical and electrical work to proceed without interfering with access-flooring pedestals.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review connection with electrical systems.
 - 2. Review procedures for keeping underfloor space clean.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For pedestal-installation adhesives, documentation including printed statement of VOC content.
 - 2. Product Data for Credit IEQ 4.3: For pedestal-installation adhesives, documentation including printed statement of VOC content.
 - 3. Product Data for Credit IEQ 4.4: For particleboard used in steel-encapsulated, wood-core panels, documentation indicating that product contains no urea formaldehyde.
- C. Shop Drawings: Include layout of access-flooring system and relationship to adjoining Work based on field-verified dimensions.
 - 1. Details and sections with descriptive notes indicating materials, finishes, fasteners, typical and special edge conditions, accessories, and understructures.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of access-flooring system.
- C. Product Test Reports: For each type of flooring material and exposed finish, for tests performed by a qualified testing agency.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. AXFL-1:
 - 1. Flooring Panels: Indicate desired quantity. 5% each type.
 - 2. Pedestals: Indicate desired quantity. Qty. 5 each type.
 - 3. Stringers: Indicate desired quantity. Qty. 2 each type.
- C. AXFL-2:
 - 1. Flooring Panels: Indicate desired quantity. 5% each type.
 - 2. Pedestals: Indicate desired quantity. Qty. 5 each type.
 - 3. Stringers: Indicate desired quantity. Qty. 2 each type.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a mockup submittal for review.
 - 1. Mockup of AXFL-2: Group of four tiles at edge of lobby.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install access flooring until spaces are enclosed, ambient temperature is between 50 and 90 degree F, and relative humidity is not less than 20 and not more than 70 percent.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Cisca (Ceilings & Interior Systems Construction Association) - "Recommended Test Procedures for Access Floors" shall be used as a guideline when presenting load performance product information.
- B. Structural Performance (**AXFL-1**): Provide access-flooring systems capable of complying with the following performance requirements according to testing procedures in Cisca's "Recommended Test Procedures for Access Floors":
 - 1. Concentrated Loads: 1000 lbf with the following deflection and permanent set:
 - a. Permanent Set: 0.010 inch.
 - 2. Ultimate Loads: 2000 lbf.
 - 3. Rolling Loads: With local or overall deformation not to exceed 0.040 inch.
 - a. Cisca Wheel 1: 10 passes a t800 lbf.
 - b. Cisca Wheel 2: 10,000 passes at 600 lbf.
 - 4. Pedestal Axial Load Test: 6000 lbf.

5. Pedestal Overturning Moment: Pedestal support assembly to provide an average overturning moment of 1000 in-lbs. when glued to a clean, sound, uncoated concrete surface when tested in accordance with CISCA AF, Section 6, "Pedestal Overturning Moment Test"
6. Drop Impact Load Test: 150 lb.
- C. Structural Performance (**AXFL-2**): Provide access-flooring systems capable of complying with the following performance requirements according to testing procedures in CISCA's "Recommended Test Procedures for Access Floors":
 1. Design Load: Panel supported on actual understructure system shall be capable of supporting a point load of 1250 lbs. applied on a one square inch area at any location on the panel without experiencing permanent set in excess of 0.010 inches as defined by CISCA.
 2. Safety Factor: Panel shall withstand a point load of no less than 1.44 times its design load rating on a one square inch area anywhere on the panel without failure when tested in accordance with CISCA A/F, Section 2 "Ultimate Loading". Failure is defined as the point at which the system will no longer accept the load.
 3. Ultimate Load: Panel shall withstand a point load of at least 1800 lbs. applied through a load indenter on a one square inch area at any location on the panel without failure when tested in accordance with CISCA A/F, Section 2 "Ultimate Loading".
 4. Rolling Load: Panel shall withstand the following rolling loads at any location on the panel without developing a local and overall surface deformation greater than 0.040 inches when tested in accordance with CISCA A/F, Section 3 "Rolling Loads". Wheel 1 and Wheel 2 tests shall be performed on separate panels.
 - a. CISCA Wheel A: 3 inches diameter x 1-13/16 inches wide (Load: 1000 lbs.): Passes: 10.
 - b. CISCA Wheel B: 6 inches diameter x 2 inches wide (Load: 800 lbs.): Passes: 10,000.
 5. Impact Load: Panel and supporting understructure (the system) shall withstand without collapse an impact load of 100 lbs. dropped from a height of 36 inches onto a one square inch area using a round or square indenter at any location on the panel when tested in accordance with CISCA A/F, Section 8 "Drop Impact Load Test".
 6. Pedestal Axial Load: Pedestal support assembly shall provide a 6000 lb. axial load without permanent deformation when tested in accordance with CISCA A/F, Section 5 "Pedestal Axial Load Test".
 7. Pedestal Overturning Moment: Pedestal support assembly shall provide an average overturning moment of 1000 in-lbs. when glued to a clean, sound, uncoated concrete surface when tested in accordance with CISCA A/F, Section 6 "Pedestal Overturning Moment Test".
 8. Stringer Concentrated Load: Stringer shall withstand a concentrated load of 450 lbs. placed at mid-span on a one square inch area using a round or square indenter without exceeding a permanent set of 0.010" when tested in accordance with CISCA A/F, Section 4 "Stringer Load Testing".
- D. Fire Performance:
 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. System shall meet Class A Flame spread requirements for flame spread and smoke development.
 2. Combustion Characteristics: ASTM E 136.
 - a. Components of the access floor system shall qualify as non-combustible by demonstrating compliance with requirements of ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain access-flooring system from single source from single manufacturer.
- B. Basis of Design (**AXFL-1**): Tate Access Floors, Inc. ConCore 1000 Access Floor Panel, PosiLock Understructure – Cornerlock System.
 1. Design Requirements:
 - a. Access floor system, where indicated on the design documents, shall consist of modular and removable fully encased cementitious filled welded steel panels fastened onto, and supported by, adjustable height pedestal assemblies. Pedestal head and panel corner design shall provide a positive location and lateral engagement of the panel to the understructure support system without the use of fasteners.
- C. Basis of Design (**AXFL-2**): Tate Access Floors, Inc. STONEWORKS: Classic Concrete, Heavy Duty Bolted Stringer Understructure.
 1. Design requirements:
 - a. Access floor system, where indicated on the design documents, shall consist of modular and removable Classic Concrete panels with factory laminated reinforcing steel bottom sheets and perimeter edge banding. Panels shall be installed in a heavy-duty bolted stringer system without the use of corner lock screws.

2.3 FLOOR PANELS

- A. Floor Panels, General: Provide modular panels interchangeable with other field panels without disturbing adjacent panels or understructure.
1. Size: Nominal 24 by 24 inches.
 2. Attachment to Understructure: Bolted.
- B. Construction (AXFL-1):
1. Panels shall consist of a top steel sheet welded to a formed steel bottom pan filled internally with a lightweight cementitious material. Mechanical or adhesive methods for attachment of the steel top and bottom sheets are unacceptable.
 2. Cementitious fill material shall be totally encased within the steel welded shell except where cut for special conditions.
 3. Panel shall have an electrically conductive epoxy paint finish.
 4. Corner of panel shall have a locating tab and integral shape design to interface with the pedestal head for positive lateral retention and positioning with or without fasteners.
 5. Fastening of panels to pedestal heads shall be accomplished by a machine screw which is specially designed to be self-capturing within the body of the panel.
 6. Fit between the pedestal head, panel, and screw shall enable an installation with an average panel to panel gap of 0.015 inch.
 7. Pedestals: Assembly consisting of base, column with provisions for height adjustment, and head (cap); made of steel.
 - a. Base: Square or circular base with not less than 16 sq. in. of bearing area.
 - b. Column: Of height required to bring finished floor to elevations indicated. Weld to base plate.
 - c. Provide vibration-proof leveling mechanism for making and holding fine adjustments in height over a range of not less than 1 inch and for locking at a selected height, so deliberate action is required to change height setting and prevent vibratory displacement.
 - d. Head: Designed to support the panel system indicated.
 - 1) Provide sound-deadening pads or gaskets at contact points between heads and panels.
 - 2) Bolted Assemblies: Provide head with four holes aligned with holes in floor panels for bolting of panels to pedestals.
- C. Construction (AXFL-2):
1. Pedestal assemblies shall be corrosive resistant, all steel welded construction and provide an adjustment range of +/- 1" for finished floor heights of 8" or greater and +/- 1/2" adjustment range for finished floor heights >5" and <8".
 2. Pedestal assemblies shall provide a means of leveling and locking the assembly at a selected height, which requires deliberate action to change the height setting and which prevents vibration displacement.
 3. Hot dip galvanized steel pedestal head shall be welded to a threaded rod which includes an adjusting nut with location lugs to engage the pedestal base assembly, such that deliberate action is required to change the height setting.
 4. Hot dip galvanized pedestal base assembly shall consist of a formed steel plate with no less than 16 inches of bearing area, welded to a 7/8" square steel tube designed to engage the head assembly.
 5. Stringers shall support each edge of panel.
 6. Steel stringer shall have conductive hot dipped galvanized or galvanized coating.
 7. Stringers shall be individually and rigidly fastened to the pedestal with one machine screw for each foot of stringer length. Bolts shall provide positive electrical contact between the stringers and pedestals. Connections depending on gravity of spring action are unacceptable.
 8. Stringers shall have factory applied gasket and formed positioning tabs for positioning of the panels.
 9. Stringer grid shall be 4' stringers in a basketweave configuration ensuring maximum lateral stability in all directions.
 10. Provide Tate Access Floors Classic Concrete panel with brushed surface texture.
 11. Panel and Edge Banding Colors: Grey with Dark Grey edge banding.
 12. Sides of panels shall be beveled and protected with factory laminated plastic edge banding.
 13. Modular and removable panels shall be nominal 24" square x 1-5/16" deep with factory laminated steel bottom sheet protected from corrosion by E-coat paint coating.
 14. Panels shall exhibit moderate variation (V2 rating) with respect to shade, color tone and sheen.
 15. Panels shall be sealed after installation (by designated contractor). In all instances for any sealer selected, a suitably sized mock-up of the Classic Concrete system shall be constructed with the specified sealer applied and reviewed by all parties to ensure desired results prior to application on installed floor system. Subject to compliance with requirements, field apply one of the following sealers:
 - a. Prosoco Concrete Protector WB (matte finish natural look sealer).

16. Bare panels shall weigh approximately 14 lbs./sq.ft.

2.4 FABRICATION

- A. Fabrication Tolerances (**AXFL-1**):
1. Size: Plus or minus 0.010 inch of required size.
 2. Squareness: Plus or minus 0.030 inch between diagonal measurements across top of panel.
 3. Flatness: Plus or minus 0.025 inch, measured on a diagonal on top of panel.
- B. Fabrication Tolerances (**AXFL-2**):
1. Floor panel flatness measured on a diagonal: +/- 0.015 inch.
 2. Floor panel flatness measured along edges: +/- 0.010 inch.
 3. Floor panel width or length of required size: +/- 0.020 inch.
 4. Floor panel squareness tolerance: within 0.040 inch.
 5. Thickness tolerance range: within 0.035 inch.
- C. Panel Markings: Clearly and permanently mark floor panels on their underside with panel type and concentrated-load rating.
- D. Bolted Panels: Provide panels with holes drilled in corners to align precisely with threaded holes in pedestal heads and to accept countersunk screws with heads flush with top of panel.
1. Captive Fasteners: Provide fasteners held captive to panels.
- E. Cutouts: Fabricate cutouts in floor panels for cable penetrations and service outlets. Provide reinforcement or additional support, if needed, to make panels with cutouts comply with structural performance requirements.
1. Number, Size, Shape, and Location: As indicated.
 2. Grommets: Where indicated, fit cutouts with manufacturer's standard grommets; or, if size of cutouts exceeds maximum grommet size available, trim edge of cutouts with manufacturer's standard plastic molding with tapered top flange. Furnish removable covers for grommets.

2.5 ACCESSORIES

- A. Adhesives: Manufacturer's standard adhesive for bonding pedestal bases to subfloor.
1. Adhesive shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Service Outlets: Standard UL-listed and -labeled assemblies, for recessed mounting flush with top of floor panels; for power, communication, and signal services; and complying with the following requirements:
1. Structural Performance: Cover capable of supporting a 1000-lbf concentrated load.
 2. Cover and Box Type: [Hinged polycarbonate cover with opening for passage of cables when cover is closed and including frame and steel box or formed-steel plate for mounting electrical receptacles][Grommet with twist-close cover and including steel junction box for electrical receptacle with provision for telephone connectors and signal cables]<Insert type>.
 3. Location: In center of panel quadrant unless otherwise indicated.
 4. Receptacles and Wiring: Electrical receptacles and wiring for service outlets are specified elsewhere.
- C. Panel Lifting Device: Panel manufacturer's standard portable lifting device for each type of panel required.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer and manufacturer's representative present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. Verify that substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, foreign deposits, and debris that might interfere with attachment of pedestals.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Lay out floor panel installation to keep the number of cut panels at floor perimeter to a minimum. Avoid using panels cut to less than 6 inches.
- B. Locate each pedestal, complete any necessary subfloor preparation, and vacuum subfloor to remove dust, dirt, and construction debris before beginning installation.

3.3 INSTALLATION

- A. Install access-flooring system and accessories under supervision of access-flooring manufacturer's authorized representative to produce a rigid, firm installation that complies with performance requirements and is free of instability, rocking, rattles, and squeaks.
- B. Adhesive Attachment of Pedestals: Set pedestals in adhesive, according to access-flooring manufacturer's written instructions, to provide full bearing of pedestal base on subfloor.
- C. Adjust pedestals to permit top of installed panels to be set flat, level, and to proper height.
- D. Install flooring panels securely in place, properly seated with panel edges flush. Do not force panels into place.
- E. Scribe perimeter panels to provide a close fit with adjoining construction with no voids greater than 1/8 inch where panels abut vertical surfaces.
 - 1. To prevent dusting, seal cut edges of steel-encapsulated, wood-core panels with sealer recommended in writing by panel manufacturer.
- F. Cut and trim access flooring and perform other dirt-or-debris-producing activities at a remote location or as required to prevent contamination of subfloor under already-installed access flooring.
- G. Grounded Flooring Access Panel Systems: Ground flooring system as recommended by manufacturer and as needed to comply with performance requirements for electrical resistance of floor coverings.
 - 1. Panel-to-Understructure Resistance: Not more than 10 ohms as measured without floor coverings.
- H. Clean dust, dirt, and construction debris caused by floor installation, and vacuum subfloor area as installation of floor panels proceeds.
- I. Install access flooring without change in elevation between adjacent panels and within the following tolerances:
 - 1. Finished floor shall be level, not varying more than 0.062 inch in 10 feet or 0.125 inch overall.

3.4 PROTECTION

- A. Prohibit traffic on access flooring for 24 hours and removal of floor panels for 72 hours after installation to allow pedestal adhesive to set.
- B. After completing installation, vacuum access flooring and cover with continuous sheets of reinforced paper or plastic. Maintain protective covering until time of Substantial Completion.
- C. Replace access-flooring panels that are stained, scratched, or otherwise damaged or that do not comply with specified requirements.

END OF SECTION 09 69 00

SECTION 09 91 13
EXTERIOR PAINTING

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19 **PART 1 - GENERAL**

20 **1.1 RELATED DOCUMENTS**

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

23 **1.2 SUMMARY**

- 24 A. Section includes surface preparation and the application of paint systems on the following exterior
25 substrates:
- 26 1. Steel and iron.
- 27 B. Related Sections:
- 28 1. Section 05 5113 "Metal Pan Stairs".
 - 29 2. Section 05 7300 "Decorative Metal Railings".

30 **1.3 DEFINITIONS**

- 31 A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to
32 ASTM D 523.
- 33 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.
- 34 C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to
35 ASTM D 523.
- 36 D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- 37 E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- 38 F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

39 **1.4 ACTION SUBMITTALS**

- 40 A. Product Data: For each type of product. Include preparation requirements and application instructions.
- 41 1. Include printout of current "MPI Approved Products List" for each product category specified, with the
42 proposed product highlighted.
- 43 B. Sustainable Design Submittals:
- 44 1. Product Data: For paints and coatings, indicating VOC content.
 - 45 2. Refer to Section 01 81 13.
- 46 C. Samples: For each type of paint system and each color and gloss of topcoat.
- 47

- 1 **1.5 QUALITY ASSURANCE**
2 A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify
3 preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality
4 standards for materials and execution.
5 1. Architect will select one surface to represent surfaces and conditions for application of each paint
6 system.
7 a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
8 b. Other Items: Architect will designate items or areas required.
9 2. Final approval of color selections will be based on mockups.
10 a. If preliminary color selections are not approved, apply additional mockups of additional colors
11 selected by Architect at no added cost to Owner.

- 12 **1.6 ATTIC STOCK SUBMITTALS**
13 A. Furnish extra materials, from the same product run, that match products installed and that are packaged
14 with protective covering for storage and identified with labels describing contents.
15 1. Paint: 5 percent, but not less than 1 gallon nor more than 3 gallon of each material and color applied.
16 2. Attic stock to be partially used cans, consolidate by color, no can less than half full labeled with paint
17 reference number, paint color formula, and dab of paint on the can cover. Mix and color information
18 clearly and legibly marked on cans.

19 **PART 2 - PRODUCTS**

- 20 **2.1 MANUFACTURERS**
21 A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may
22 be incorporated into the Work include, but are not limited to the following:
23 1. Benjamin Moore & Co.
24 2. Dulux (formerly ICI Paints); a brand of AkzoNobel.
25 3. Sherwin-Williams Company (The).
26 4. Tnemec
27 5. Valspar Corporation - Architectural (Pro).
28 B. Paint Type: 100% Acrylic Latex.
29 1. Volume Solids (min.): 42%.
30 2. Volatile Organic Compounds (VOC): 144 Grams/Liter 1.20lbs./Gallon.
31 3. Basis of Design: Benjamin Moore Moorglo 100% acrylic paint fortified with alkyd resin.

- 32 **2.2 PAINT, GENERAL**
33 A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved
34 Products Lists."
35 B. Material Compatibility:
36 1. Materials for use within each paint system shall be compatible with one another and substrates
37 indicated, under conditions of service and application as demonstrated by manufacturer, based on
38 testing and field experience.
39 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers
40 for use in paint system and on substrate indicated.
41 C. VOC Content: For field applications, paints and coatings shall comply with VOC content limits of authorities
42 having jurisdiction and the following VOC content limits:
43 1. Flat Paints and Coatings: 50 g/L.
44 2. Nonflat Paints and Coatings: 50 g/L.
45 3. Rust-Preventive Coatings: 100 g/L.
46 4. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
47 D. Colors: As indicated in a color schedule.
48

1 **PART 3 - EXECUTION**

2 **3.1 EXAMINATION**

- 3 A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum
4 moisture content and other conditions affecting performance of the Work.
5 B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and
6 primers.
7 C. Proceed with coating application only after unsatisfactory conditions have been corrected.
8 1. Application of coating indicates acceptance of surfaces and conditions.

9 **3.2 PREPARATION**

- 10 A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting
11 Specification Manual" applicable to substrates and paint systems indicated.
12 B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be
13 painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied
14 protection before surface preparation and painting.
15 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that
16 were removed. Remove surface-applied protection.

17 **3.3 APPLICATION**

- 18 A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
19 B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller
20 tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

21 **3.4 CLEANING AND PROTECTION**

- 22 A. Protect work of other trades against damage from paint application. Correct damage to work of other trades
23 by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged
24 condition.
25 B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted
26 surfaces.

27 **3.5 EXTERIOR PAINTING SCHEDULE**

- 28 A. Steel and Iron Substrates:
29 1. Exterior steel paint system shall be epoxy zinc rich shop primer with semi-gloss acrylic topcoat.
30 a. Two coats required not including primer/intermediate coat if required.

31 **END OF SECTION**

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SECTION 09 91 23
INTERIOR PAINTING

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19 **PART 1 - GENERAL**

20 **1.1 RELATED DOCUMENTS**

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

23 **1.2 SUMMARY**

- 24 A. Section includes surface preparation and the application of paint systems on the following interior substrates:
25 1. Concrete.
26 2. Concrete masonry units (CMUs).
27 3. Steel and iron.
28 4. Aluminum (not anodized or otherwise coated).
29 5. Wood.
30 6. Gypsum board.

31 **1.3 DEFINITIONS**

- 32 A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to
33 ASTM D 523.
34 B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to
35 ASTM D 523.
36 C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
37 D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to
38 ASTM D 523.
39 E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
40 F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
41 G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.
42 H. Paint Gloss Reference: Refer to Material ID List on the Drawings.
43 1. (PT-X) Sheen and or color.

44 **1.4 ACTION SUBMITTALS**

- 45 A. Product Data: For each type of product. Include preparation requirements and application instructions.
46 1. Include Printout of current "MPI Approved Products List" for each product category specified, with
47 the proposed product highlighted.
48 B. Sustainable Design Submittals:
49 1. Product Data: For paints and coatings, indicating VOC content.
50 C. Samples: For each type of paint system and in each color and gloss of topcoat.

- 1 **1.5 QUALITY ASSURANCE**
2 A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify
3 preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality
4 standards for materials and execution.
5 1. Architect will select one surface to represent surfaces and conditions for application of each paint
6 system.
7 a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
8 b. Other Items: Architect will designate items or areas required.
9 2. Final approval of color selections will be based on mockups.
10 a. If preliminary color selections are not approved, apply additional mockups of additional colors
11 selected by Architect at no added cost to Owner.

- 12 **1.6 ATTIC STOCK SUBMITTALS**
13 A. Furnish extra materials, from the same product run, that match products installed and that are packaged
14 with protective covering for storage and identified with labels describing contents.
15 1. Paint: 5 percent, but not less than 1 gallon nor more than 3 gallon of each material and color applied.
16 2. Attic stock to be partially used cans, consolidate by color, no can less than half full labeled with paint
17 reference number, paint color formula, and dab of paint on the can cover. Mix and color information
18 clearly and legibly marked on cans.

19 **PART 2 - PRODUCTS**

- 20 **2.1 MANUFACTURERS**
21 A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may
22 be incorporated into the Work include, but are not limited to the following:
23 1. Benjamin Moore & Co.
24 2. Dulux (formerly ICI Paints); a brand of AkzoNobel.
25 3. PPG Architectural Coatings.
26 4. Sherwin-Williams Company (The).
27 5. Valspar Corporation - Architectural (Pro).
28 B. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting
29 Schedule for the paint category indicated.

- 30 **2.2 PAINT, GENERAL**
31 A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved
32 Products Lists."
33 B. Paint Type: 100% Acrylic, Zero VOC.
34 1. Zero VOC according to EPA Method 24.
35 2. Standard Guide D 5116 and CDPH/EHLB/Standard Method v1.1.
36 3. Class A (0-25) over non-combustible surfaces when tested in accordance with ASTM E-84.
37 4. Master Painters Institute MPI # 44, 44 X-Green™, 144, 144 X-Green™.
38 5. Basis of Design: Benjamin Moore Natura.
39 C. Material Compatibility:
40 1. Materials for use within each paint system shall be compatible with one another and substrates
41 indicated, under conditions of service and application as demonstrated by manufacturer, based on
42 testing and field experience.
43 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers
44 for use in paint system and on substrate indicated.
45 D. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall
46 comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
47 1. Paints and Primers: 0 g/L.
48 2. Dry-Fog Coatings: 400 g/L.
49 3. Sealers, and Undercoaters: 200 g/L.
50 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
51 5. Shellacs, Clear: 730 g/L.
52 6. Shellacs, Pigmented: 550 g/L.
53 E. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements
54 of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile
55 Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
56 F. Colors: As indicated in a color schedule.
57

1 **PART 3 - EXECUTION**

2 **3.1 EXAMINATION**

- 3 A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum
4 moisture content and other conditions affecting performance of the Work.
5 B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
6 1. Concrete: 12 percent.
7 2. Fiber-Cement Board: 12 percent.
8 3. Masonry (Clay and CMUs): 12 percent.
9 4. Wood: 15 percent.
10 5. Gypsum Board: 12 percent.
11 6. Plaster: 12 percent.
12 C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and
13 primers.
14 D. Proceed with coating application only after unsatisfactory conditions have been corrected.
15 1. Application of coating indicates acceptance of surfaces and conditions.

16 **3.2 PREPARATION**

- 17 A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting
18 Specification Manual" applicable to substrates and paint systems indicated.
19 B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be
20 painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied
21 protection before surface preparation and painting.
22 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that
23 were removed. Remove surface-applied protection if any.

24 **3.3 APPLICATION**

- 25 A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural
26 Painting Specification Manual."
27 B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller
28 tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

29 **3.4 INTERIOR PAINTING SCHEDULE**

- 30 A. CMU Substrates:
31 1. Institutional Low-Odor/VOC Latex System MPI INT 3.1M:
32 a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
33 b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
34 c. Topcoat: Latex, interior, institutional low odor/VOC, MPI #143.
35 B. Steel Substrates:
36 1. Institutional Low-Odor/VOC Latex System MPI INT 5.1S:
37 a. Prime Coat (Not shop primed): Primer, rust inhibitive, water based MPI #107.
38 b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
39 c. Topcoat: Latex, interior, institutional low odor/VOC, MPI #144.
40 C. Aluminum (Not Anodized or Otherwise Coated) Substrates:
41 1. Institutional Low-Odor/VOC Latex System MPI INT 5.4G:
42 a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
43 b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
44 c. Topcoat: Latex, interior, institutional low odor/VOC, MPI #144.
45

- 1 D. Wood Substrates: Wood trim, Architectural woodwork.
- 2 1. Clear prep/sealer (water based polyurethane):
- 3 E. Gypsum Board and Plaster Substrates:
- 4 1. Institutional Low-Odor/VOC Latex System MPI INT 9.2M:
- 5 a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #144.
- 6 b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- 7 c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1), MPI #143.
- 8 F. Insulation-Covering Substrates: Including pipe and duct coverings.
- 9 1. Institutional Low-Odor/VOC Dryfall Latex System MPI INT 10.1D:
- 10 a. Prime Coat: Primer sealer, latex, interior, MPI #50.
- 11 b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- 12 c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1), MPI #143.

13 **3.5 PAINT COLOR SCHEDULE**

- 14 A. TABLE OF PAINT COLORS
- 15 1. Colors indicated by Benjamin Moore & Co. unless noted otherwise.
- 16 2. Refer to Material ID List on the Drawings for color designations.
- 17

18 **END OF SECTION**

SECTION 10 11 00
VISUAL DISPLAY UNITS

- 1
2
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4 [1.1 RELATED DOCUMENTS](#)
5 [1.2 SUMMARY](#)
6 [1.3 ACTION SUBMITTALS](#)
7 [1.4 CLOSEOUT SUBMITTALS](#)
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18 [3.4 CLEANING AND PROTECTION](#)
19 [3.5 DEMONSTRATION](#)

20 **PART 1 - GENERAL**

21 **1.1 RELATED DOCUMENTS**

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

24 **1.2 SUMMARY**

- 25 A. Section Includes:
26 1. Glass marker boards (**GLBD-#**).

27 **1.3 ACTION SUBMITTALS**

- 28 A. Product Data: For each type of product.
29 1. Include construction details, material descriptions, dimensions of individual components and
30 profiles, finishes, and accessories for visual display units.
31 B. Shop Drawings: For visual display units.
32 1. Include plans, elevations, sections, details, and attachment to other work.
33 2. Show locations of panel joints.
34 C. Samples for Verification: For each type of visual display unit indicated.
35 1. Visual Display Panel: Not less than 8-1/2 by 11 inches, with glass facing indicated for final Work.
36 Include one panel for each type, color, and texture required.
37 2. Accessories: Full-size Sample of each type of accessory.
38 D. Product Schedule: For visual display units. Use same designations indicated on Drawings.

39 **1.4 CLOSEOUT SUBMITTALS**

- 40 A. Maintenance Data: For visual display units to include in maintenance manuals.

41 **1.5 QUALITY ASSURANCE**

- 42 A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by
43 manufacturer.

44 **1.6 DELIVERY, STORAGE, AND HANDLING**

- 45 A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed
46 maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more
47 pieces with joints in locations indicated on approved Shop Drawings.
48

1 **1.7 PROJECT CONDITIONS**

- 2 A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and
3 weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary
4 HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy
5 levels during the remainder of the construction period.
6 B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field
7 measurements before fabrication.
8 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the
9 Work.

10 **PART 2 - PRODUCTS**

11 **2.1 MANUFACTURERS**

- 12 A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

13 **2.2 GLASS MARKERBOARDS**

- 14 A. Basis-of-Design Product: Subject to compliance with requirements, provide Clarus Glassboards Wall2Wall
15 or comparable product by one of the following:
16 1. Egan Visual Inc.
17 2. Element Designs.
18 B. Units: Refer to **(GLBD-#)** on the Material ID List:
19 1. Back Painted Magnetic Glass (Marker Boards).
20 2. **GLBD-1A** Color: White.
21 3. **GLBD-1A** Color: Black.
22 4. Thickness: As scheduled.
23 5. Glass: Low-iron, PPG Starphire tempered safety glass.
24 6. Glass Markerboards: tempered glass markerboard, with smooth polished edge and corners as
25 indicated. Color coated on back surface.
26 C. Mounting: Flush wall mounting. Concealed bottom L-channel and T-trim for butt joints..
27 D. Marker Tray: Glass, supported by magnetic alloy material.

28 **PART 3 - EXECUTION**

29 **3.1 EXAMINATION**

- 30 A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation
31 tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
32 B. Examine walls and partitions for proper preparation and backing for visual display units.
33 C. Proceed with installation only after unsatisfactory conditions have been corrected.

34 **3.2 PREPARATION**

- 35 A. Comply with manufacturer's written instructions for surface preparation.
36 B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and
37 affect the smooth, finished surfaces of visual display boards.
38 C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks,
39 defects, projections, depressions, and substances that will impair bond between visual display units and
40 wall surfaces.

41 **3.3 INSTALLATION**

- 42 A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if
43 not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds,
44 clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete
45 installation.
46 B. Installation:
47 1. Apply L-Channel to wall to ensure panels will be level.
48 2. Apply structural glazing tape (not provided) to perimeter of glass for support during curing phase of
49 adhesive.
50 3. Apply construction grade adhesive in a consistent pattern to the back of each glass panel, ensuring
51 adhesive will not bleed out from behind the panel

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4. Peel backer from glazing tape and place glass onto drywall
 5. Slide T-Trim under the edge of the panel so the adjoining panel will be properly spaced if adjoining multiple panels
 6. Repeat this process until all panels have been installed
 7. Determine if additional bracing is recommended by reading the instructions on adhesive
- 3.4 CLEANING AND PROTECTION**
- A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
 - B. Touch up factory-applied finishes to restore damaged or soiled areas.
 - C. Cover and protect visual display units after installation and cleaning.
- 3.5 DEMONSTRATION**
- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motorized, sliding visual display units.
- END OF SECTION**

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SECTION 10 22 39

FOLDING PANEL PARTITIONS

PART 1 – GENERAL

- 1.1 [RELATED DOCUMENTS](#)
- 1.2 [SUMMARY](#)
- 1.3 [DEFINITIONS](#)
- 1.4 [PREINSTALLATION MEETINGS](#)
- 1.5 [ACTION SUBMITTALS](#)
- 1.6 [INFORMATIONAL SUBMITTALS](#)
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PART 2 – PRODUCTS

- 2.1 [MANUFACTURERS, PRODUCTS, AND OPERATIONS](#)
- 2.2 [PERFORMANCE REQUIREMENTS](#)
- 2.3 [OPERABLE ACOUSTICAL PANELS](#)
- 2.4 [PANEL CONSTRUCTION](#)
- 2.5 [PANEL FINISH](#)
- 2.6 [SOUND SEALS](#)
- 2.7 [SUSPENSION SYSTEM](#)

PART 3 – EXECUTION

- 3.1 [EXAMINATION](#)
- 3.2 [INSTALLATION](#)
- 3.3 [ADJUSTING](#)
- 3.4 [DEMONSTRATION](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Manually operated, acoustical paired panel partitions (**OP-01**).
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications" for supports that attach supporting tracks to overhead structural system.

1.3 DEFINITIONS

- A. NIC: Noise Isolation Class.
- B. NRC: Noise Reduction Coefficient.
- C. STC: Sound Transmission Class.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For operable panel partitions.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.
- C. Samples for Verification: For each type of exposed material, finish, covering, or facing, prepared on Samples of size indicated below:
 - 1. Panel Facing Material: Manufacturer's standard-size unit, not less than 3 inches square.

- 1 **1.6 INFORMATIONAL SUBMITTALS**
- 2 A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown
- 3 and coordinated with each other, using input from installers of the items involved:
- 4 1. Partition track, track supports and bracing, switches, turning space, and storage layout including
- 5 floor tolerances required and direction of travel. Indicate blocking to be provided by others.
- 6 2. Suspended ceiling components.
- 7 3. Structural members to which suspension systems are attached.
- 8 4. Size and location of initial access modules for acoustical tile.
- 9 5. Items penetrating finished ceiling, including the following:
- 10 a. Lighting fixtures.
- 11 b. HVAC ductwork, outlets, and inlets.
- 12 c. Speakers.
- 13 d. Sprinklers.
- 14 e. Smoke detectors.
- 15 f. Access panels.
- 16 6. Plenum acoustical barriers.
- 17 B. Sample Warranty: For manufacturer's special warranty.
- 18 **1.7 CLOSEOUT SUBMITTALS**
- 19 A. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals.
- 20 1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the
- 21 following:
- 22 a. Panel finish facings and finishes for exposed trim and accessories. Include precautions for
- 23 cleaning materials and methods that could be detrimental to finishes and performance.
- 24 b. Seals, hardware, track, track switches, carriers, and other operating components.
- 25 **1.8 MAINTENANCE MATERIAL SUBMITTALS**
- 26 A. Furnish extra materials, from the same production run, that match products installed and that are
- 27 packaged with protective covering for storage and identified with labels describing contents.
- 28 1. Panel Finish-Facing Material: Furnish full width in quantity to cover both sides of two panels when
- 29 installed. Store and labeled in protective type tube or box with a swatch on outside.
- 30 **1.9 QUALITY ASSURANCE**
- 31 A. Installer Qualifications: An experienced installer who is certified in writing by the operable partition
- 32 manufacturer, as qualified to install the manufacturer's partition systems for work similar in material,
- 33 design, and extent to that indicated for this Project.
- 34 B. Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance
- 35 with ASTM E90 test procedure to attain no less than the STC rating specified. Provide a complete and
- 36 unedited written test report by the testing laboratory upon request.
- 37 C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 "Standard Practice for
- 38 Architectural Application and Installation of Operable Partitions."
- 39 **1.10 DELIVERY, STORAGE, AND HANDLING**
- 40 A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with
- 41 numbering system used on Shop Drawings. Do not use permanent markings on panels.
- 42 **1.11 WARRANTY**
- 43 A. Special Warranty: Manufacturer agrees to repair or replace components of operable panel partitions that
- 44 fail in materials or workmanship within specified warranty period.
- 45 1. Failures include, but are not limited to, the following:
- 46 a. Faulty operation of operable panel partitions.
- 47 b. Deterioration of metals, metal finishes, and other materials beyond normal use.
- 48 2. Partition Warranty period: Two (2) years from date of shipment.
- 49 3. Suspension System Warranty: Five (5) years from date of shipment.
- 50

1 **PART 2 - PRODUCTS**

2 **2.1 MANUFACTURERS, PRODUCTS, AND OPERATIONS**

- 3 A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- 4 1. Modernfold, Inc.
- 5 B. Products: Subject to compliance with the requirements, provide the following product:
- 6 1. **OP-01**: Acousti-Seal Encore manually operated paired panel operable partition.

7 **2.2 PERFORMANCE REQUIREMENTS**

- 8 A. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the
- 9 following acoustical properties according to test methods indicated:
- 10 1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-
- 11 transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for
- 12 not less than the STC indicated.

13 **2.3 OPERABLE ACOUSTICAL PANELS**

- 14 A. **OP-01**: Acousti-Seal Encore: Series of paired flat panels hinged together in pairs, manually operated, top
- 15 supported with operable floor seals and automatic top seals.
- 16 B. Final Closure:
- 17 1. Horizontally expanding panel edge with removable crank

18 **2.4 PANEL CONSTRUCTION**

- 19 A. Nominal 4-1/4-inch (108 mm) thick panels in manufacturer's standard 51-inch (1295 mm) widths. All panel
- 20 horizontal and vertical framing members fabricated from minimum 16-gage formed steel with overlapped
- 21 and welded corners for rigidity. Top channel is reinforced to support suspension system components.
- 22 Frame is designed so that full vertical edges of panels are of formed steel and provide concealed
- 23 protection of the edges of the panel skin.
- 24 B. Panel skin shall be:
- 25 1. Roll-formed steel wrapping around panel edge. Panel skins shall be lock formed and welded
- 26 directly to the frame for unitized construction. Acoustical ratings of panels with this construction:
- 27 a. 54 STC.
- 28 C. Hinges for Panels, Closure Panels and Pocket Doors shall be:
- 29 1. Full leaf butt hinges, attached directly to the panel frame. Welded hinge anchor plates within panel
- 30 shall further support hinge mounting to frame. Hinges mounted into panel edge or vertical astragal
- 31 are not acceptable.
- 32 D. Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at panel
- 33 joints.
- 34 E. Panel Weights:
- 35 1. 54 STC – 9.5 lbs./square foot.

36 **2.5 PANEL FINISH**

- 37 A. Panel finish shall be factory applied, Class "A" rated material. Finish shall be:
- 38 1. A perforated panel facing for acoustical absorption. The fabric cladding is per materials list: Xorel:
- 39 Sleet Embroider, Color 6299-820.
- 40 B. Panel Trim: Exposed panel trim of one consistent color:
- 41 1. Architect's selection from manufacturer's options.

42 **2.6 SOUND SEALS**

- 43 A. Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with reversible tongue and
- 44 groove configuration in each panel edge for universal panel operation. Rigid plastic astragals or astragals
- 45 in only one panel edge are not acceptable.
- 46 B. Horizontal Top Seals shall be Modernfold SureSet™ automatic operable top seals, manually operated
- 47 operable top seals not required or permitted.
- 48 C. Horizontal bottom floor seals shall be:
- 49 1. SA2 - Automatic bottom seals providing nominal 2-inch (51 mm) operating clearance with an
- 50 operating range of +1/2-inch (13 mm) to -1-1/2-inch (38 mm) which automatically drop as panels
- 51 are positioned, without the need for tools or cranks. Extended seal shall exert nominal 120 pounds
- 52 (265 kg) downward force to the floor throughout operating range.
- 53

1 **2.7 SUSPENSION SYSTEM**

- 2 A. Modernfold #17 Suspension System Direct with Trim:
- 3 1. Suspension Tracks: Minimum 11-gauge, 0.12-inch (3.04mm) roll-formed steel track for direct
- 4 mounting to a wood header and steel plate.
- 5 a. Exposed track soffit: Steel, integral to track, and pre-painted off-white.
- 6 2. Carriers: One all-steel trolley with steel tired ball bearing wheels per panel (except hinged panels).
- 7 Non-steel tires are not acceptable.

8 **PART 3 - EXECUTION**

9 **3.1 EXAMINATION**

- 10 A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements
- 11 for installation tolerances and other conditions affecting performance of operable panel partitions.
- 12 B. Proceed with installation only after unsatisfactory conditions have been corrected.

13 **3.2 INSTALLATION**

- 14 A. General: Comply with ASTM E 557 except as otherwise required by operable panel partition
- 15 manufacturer's written installation instructions.
- 16 B. Install operable panel partitions and accessories after other finishing operations, including painting, have
- 17 been completed in area of partition installation.
- 18 C. Install panels from marked packages in numbered sequence indicated on Shop Drawings.
- 19 D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.
- 20 E. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not
- 21 acceptable.
- 22 F. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and
- 23 bottom seals for voids. Adjust partitions for alignment and full closure of vertical joints and full closure
- 24 along top and bottom seals.

25 **3.3 ADJUSTING**

- 26 A. Adjust operable panel partitions, hardware, and other moving parts to function smoothly, and lubricate as
- 27 recommended by manufacturer.
- 28 B. Verify that safety devices are properly functioning.

29 **3.4 DEMONSTRATION**

- 30 A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust,
- 31 operate, and maintain operable panel partitions.

32 **END OF SECTION 10 22 39**

SECTION 10 28 00

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 – GENERAL

- 1.1 [RELATED DOCUMENTS](#)
- 1.2 [SUMMARY](#)
- 1.3 [ACTION SUBMITTALS](#)
- 1.4 [INFORMATIONAL SUBMITTALS](#)
- 1.5 [CLOSEOUT SUBMITTALS](#)
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PART 2 – PRODUCTS

- 2.2 [PUBLIC-USE WASHROOM ACCESSORIES](#)
- 2.3 [CHILDCARE ACCESSORIES](#)
- 2.4 [UNDERLAVATORY GUARDS](#)
- 2.6 [FABRICATION](#)

PART 3 – EXECUTION

- 3.1 [INSTALLATION](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Childcare accessories.
 - 3. Underlavatory guards

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: Full size, for each exposed product and for each finish specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

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. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PUBLIC-USE WASHROOM ACCESSORIES

- A. Refer to Material ID List on the Drawings for items scheduled but not specified.
 - 1. TA-04 Toilet Tissue Dispenser Jumbo-Roll (OFCI)
 - 2. TA-05 Paper Towel (Folded) Dispenser
 - 3. TA-06 Paper Towel (Roll) Dispenser (OFCI)
 - 4. TA-11 Liquid-Soap Dispenser (OFCI)
 - 5. TA-14 Sanitary-Napkin Disposal Unit
 - 6. TA-17 Mirror Unit (Framed)
 - 7. TA-19 Hook

- 1 B. Grab Bar **(T-12)**:
2 1. Mounting: Flanges with concealed fasteners.
3 2. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
- 4 a. Finish: Smooth, No. 4 finish (satin).
- 5 3. Outside Diameter: 1-1/2 inches (38 mm).
6 4. Configuration and Length: As indicated on Drawings.
- 7 **2.2 CHILDCARE ACCESSORIES**
8 A. Diaper-Changing Station **TA-24**:
9 1. Description: Horizontal unit that opens by folding down from stored position and with child-
10 protection strap.
11 a. Engineered to support minimum of 250-lb static load when opened.
12 2. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
13 3. Operation: By pneumatic shock-absorbing mechanism.
14 4. Material and Finish: HDPE with plastic-laminate insert in color selected by Architect.
15 5. Liner Dispenser: Built in.
- 16 **2.3 UNDERLAVATORY GUARDS**
17 A. Underlavatory Guard:
18 1. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct
19 contact with and burns from piping; allow service access without removing coverings.
20 2. Material and Finish: Antimicrobial, molded plastic, white.
- 21 **2.4 FABRICATION**
22 A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide
23 minimum of six keys to Owner's representative.

24 **PART 3 - EXECUTION**

- 25 **3.1 INSTALLATION**
26 A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to
27 substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored
28 in locations and at heights indicated.
29 B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

30 **END OF SECTION**

SECTION 10 44 13

FIRE EXTINGUISHER CABINETS

PART 1 – GENERAL

[1.1 RELATED DOCUMENTS](#)

[1.2 SUMMARY](#)

[1.3 SUBMITTALS](#)

[1.4 QUALITY ASSURANCE](#)

[1.5 COORDINATION](#)

PART 2 – PRODUCTS

[2.1 MATERIALS](#)

[2.2 FIRE PROTECTION CABINET \(FEC-1\)](#)

[2.3 FABRICATION](#)

[2.4 GENERAL FINISH REQUIREMENTS](#)

[2.5 FINISHES](#)

PART 3 – EXECUTION

[3.1 EXAMINATION](#)

[3.2 PREPARATION](#)

[3.3 INSTALLATION](#)

[3.4 ADJUSTING AND CLEANING](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
1. Fire protection cabinets (**FEC**).
- B. Related Sections:
1. Division 10 Section "Fire Extinguishers."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 QUALITY ASSURANCE

- A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 COORDINATION

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire protection cabinets with wall depths.

1 **PART 2 - PRODUCTS**

2 **2.1 MATERIALS**

- 3 A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
4 B. Stainless-Steel Sheet: ASTM A 666, Type 304.

5 **2.2 FIRE PROTECTION CABINET (FEC).**

- 6 A. Cabinet: Cold rolled steel with an electrostatically applied, thermally-fused polyester coating with
7 recoatable white finish, and a continuous hinge. Door and Frame: Model 7050-7069: Stainless Steel -
8 #304 Stainless steel with #4 finish. Provide where walls are of insufficient depth for recessed cabinets but
9 are of sufficient depth to accommodate semi-recessed cabinet installation.
10 1. Provide fire rated box where scheduled in fire rated walls.
11 2. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
12 3. Cabinet Trim Material: Same material and finish as door.
13 4. Door Style: F-FP Flush Solid Metal & Flush Pull Handle. Identify fire extinguisher in security fire
14 protection cabinet with the words "FIRE EXTINGUISHER."
15 5. Lettering: Vertical white.
16 B. Cabinet Type: Suitable for fire extinguisher.
17 1. Basis of Design:
18 a. Mfr: Potter Roemer.
19 b. Product: Recessed Alta Fire Extinguisher Cabinets (Recessed and semi-recessed).
20 C. Accessories
21 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to security
22 fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with
23 plated or baked-enamel finish.

24 **2.3 FABRICATION**

- 25 A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware
26 to suit cabinet type, trim style, and door style indicated.
27 1. Weld joints and grind smooth.
28 2. Provide factory-drilled mounting holes.
29 3. Prepare doors and frames to receive locks.
30 4. Install door locks at factory.
31 B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and
32 coordinated with cabinet types and trim styles selected.
33 1. Fabricate door frames of one-piece construction with edges flanged.
34 2. Miter and weld perimeter door frames.

35 **2.4 GENERAL FINISH REQUIREMENTS**

- 36 A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations
37 for applying and designating finishes.
38 B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a
39 strippable, temporary protective covering before shipping.
40 C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in
41 appearance of adjoining components are acceptable if they are within the range of approved Samples and
42 are assembled or installed to minimize contrast.

43 **2.5 FINISHES**

- 44 A. Stainless-Steel: Facing sheets and closures fabricated from ASTM A 666, Type 302 or 304, stainless-
45 steel sheet.
46 1. Finish: No. 4 bright, directional polish on exposed faces. Exposed surfaces are protected from
47 damage by application of strippable, temporary protective covering before shipment.

48 **PART 3 - EXECUTION**

49 **3.1 EXAMINATION**

- 50 A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be
51 installed.

1 B. Proceed with installation only after unsatisfactory conditions have been corrected.

2 **3.2 PREPARATION**

3 A. Prepare recesses for semirecessed fire protection cabinets as required by type and size of cabinet and
4 trim style.

5 **3.3 INSTALLATION**

6 A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated,
7 at heights acceptable to authorities having jurisdiction.

8 1. Fire Protection Cabinets: 54 inches above finished floor to top of cabinet.

9 B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

10 1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not
11 adequate for recessed cabinets, provide semirecessed fire protection cabinets.

12 2. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

13 **3.4 ADJUSTING AND CLEANING**

14 A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed
15 unless otherwise indicated in manufacturer's written installation instructions.

16 B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices
17 operate properly.

18 C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended
19 by manufacturer.

20 D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished
21 appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and
22 mounting bracket manufacturers.

23 E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair
24 by finish touchup or similar minor repair procedures.

25 **END OF SECTION 10 44 13**

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SECTION 10 44 16

FIRE EXTINGUISHERS

PART 1 – GENERAL

[1.1 RELATED DOCUMENTS](#)

[1.2 SUMMARY](#)

[1.3 SUBMITTALS](#)

[1.4 QUALITY ASSURANCE](#)

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PART 2 – PRODUCTS

[2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS](#)

[2.2 MOUNTING BRACKETS](#)

PART 3 – EXECUTION

[3.1 EXAMINATION](#)

[3.2 INSTALLATION](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.
B. Related Sections:
1. Division 10 Section "Fire Extinguisher Cabinets."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.
C. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.
D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Substantial Completion.

1 **PART 2 - PRODUCTS**

2 **2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS (FEX-1)**

- 3 A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket
4 indicated.
5 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
6 a. AMEREX.
7 2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
8 B. Multipurpose Dry-Chemical Type: ABC Model 3010. UL Rating 4A-10BC nominal capacity, with
9 monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

10 **2.2 MOUNTING BRACKETS**

- 11 A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall
12 or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black
13 baked-enamel finish.
14 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
15 a. J. L. Industries, Inc.; a division of Activar Construction Products Group.
16 b. Larsen's Manufacturing Company.
17 B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and
18 location. Locate as indicated by Architect.
19 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter
20 decals applied to mounting surface.
21 a. Orientation: Vertical.

22 **PART 3 - EXECUTION**

23 **3.1 EXAMINATION**

- 24 A. Examine fire extinguishers for proper charging and tagging.
25 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
26 B. Proceed with installation only after unsatisfactory conditions have been corrected.

27 **3.2 INSTALLATION**

- 28 A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with
29 requirements of authorities having jurisdiction.
30 1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.
31 B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

32 **END OF SECTION 10 44 16**

SECTION 11 24 00

FALL PROTECTION

PART 1 – GENERAL

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- [1.2 REFERENCES](#)
- [1.3 SYSTEM DESCRIPTION](#)
- [1.4 SUBMITTALS](#)
- [1.5 QUALITY ASSURANCE](#)

PART 2 – PRODUCTS

- [2.1 MATERIALS](#)
- [2.2 COMPONENTS](#)
- [2.3 FABRICATION](#)

PART 3 – EXECUTION

- [3.1 EXAMINATION](#)
- [3.2 INSTALLATION](#)
- [3.3 TRAINING](#)

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Design a complete horizontal lifeline fall arrest protection system to safeguard workers on the roof (**FAS**).
- B. Furnish, fabricate and install all cables, intermediate brackets, end terminations, supplementary steel support stanchions and user equipment as required to provide fall protection coverage indicated on the plans and to provide a complete and working fall protection system.
- C. Develop training program in the use, care and maintenance of all equipment to be furnished.
- D. Develop procedures, furnish all necessary equipment and provide training for the safe implementation of both assisted and unassisted rescues in the event of a fall.

1.2 REFERENCES

- A. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with:
 - 1. American National Standards Institute (ANSI):
 - a. A10.14-1991 - Construction and Demolition Operations Requirements for Safety Belts, Harnesses, Lanyards, Lifelines, and Drop Lines for Construction and Demolition Use.
 - b. Z359.1- 1992 - Safety Requirements for Personal Fall Arrest Systems, Subsystems, and Components.
 - 2. Occupational Safety and Health Administration (OSHA):
 - a. CFR 29 Part 1910 - Occupational Safety and Health Standards.
 - b. CFR 29 Part 1926 - Safety and Health Regulations for Construction.

1.3 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Horizontal lifeline fall protection system to provide coverage as indicated on the contract plans.
 - 2. Design to accommodate the number of users indicated on the plans.
 - 3. Engineering analysis of the horizontal lifeline system to provide for the simultaneous fall of all users on a cable. Analysis shall be based on the fall occurring at the most critical location along the cables length.
 - 4. Design all necessary steel stanchions to provide supplementary support for the horizontal lifeline.
 - 5. All components of the horizontal lifeline system, and supplementary steel stanchions, shall maintain a factor of safety of 2 relative to the maximum dynamic forces generated by the critical loading conditions referenced above.
- B. Functional Requirements:
 - 1. Description: Fall protection system to consist of the following:
 - a. Safety cable attached to the structure with end brackets. Cable to be continuous or have swaged splices which allow user to pass intermediate supports without unhooking from the system.
 - b. Turnbuckle at one or both ends.
 - c. Cable Supports: Intermediate cable supports designed to allow user to pass without unhooking from the cable. Space supports at intervals to permit the required number of users as indicated on the plans.
 - d. Detachable lanyard coupler to be hooked and unhooked anywhere along the cable length and able to bypass intermediate cable supports without having to be detached.

- e. Supports and brackets attached to the building structure with appropriate anchors of proper size and embedment to adequately support the load.
- f. Cables to be positioned to provide a minimum 6 feet-8 inches clearance over all catwalks and obstructions.

1.4 SUBMITTALS

- A. Prior to fabricating any parts, shop drawings shall be prepared under the supervision of a professional engineer registered in the state of Indiana.
- B. Shop Drawings: Drawings shall include all design data, loading information, material specifications, applicable design codes, table of maximum dynamic reactions, complete details and schedules of all components. Show locations of all fall protection systems, connection requirements and other pertinent information required for fabrication, coordination, and installation.
 - 1. Show complete layout and configuration of system.
 - 2. Clearly indicate design and fabrication details, plans, elevations, component profiles and sizes, hardware and installation details, number of users, loads and deflections.
 - 3. Fully detail all anchors and connections to structure including details of supplementary steel support stanchions and end terminations.
 - 4. Shop drawings to be sealed by a qualified professional engineer Registered in the State of Wisconsin.
- C. Product Data: Provide manufacturer's product information and data. Include specialty components of this specific system if not fully detailed or explained on shop drawings.
- D. Provide Maintenance Manuals with Operating Instructions.
- E. Letter of Certification.
- F. Experience Information: Include description of fall protection system installations, location, date, and Owner's name, address, and phone number.
- G. Samples: Submit the following product samples with bid:
 - 1. One swaged end termination with tensioner/turnbuckle
 - 2. One foot section of cable
 - 3. One intermediate bracket
 - 4. Detachable lanyard sleeve link with by-pass capability

1.5 QUALITY ASSURANCE

- A. Product Source: All fall protection system equipment to be by a single manufacturer.
 - 1. Ensure uniform fall protection system equipment quality, ease of maintenance, and minimal parts storage.
- B. Qualifications: Contract provides for the design, manufacture and installation of fall protection systems. Appropriate experience, qualifications and insurance coverage shall be evidenced by compliance with the following:
- C. Engineering: Design of the horizontal lifeline systems and supporting stanchions shall be performed by a professional engineer, registered in the State of Wisconsin, with experience in designing not less than 5 installations for arena rigging applications. The engineer/firm shall maintain an Errors and Omissions Insurance Policy (Professional/Design Liability) with limits of not less than \$1 million per occurrence, \$2 million aggregate.
- D. Manufacturing: Manufacturer of the horizontal lifeline components, user equipment and rescue equipment shall be performed by an established fall protection manufacturing firm which has been in business not less than 5 years. The manufacturer shall maintain Commercial General and Excess Liability insurance coverage for Products and Completed Operations with limits of not less than \$2 million per occurrence, \$10 million aggregate.
- E. Installation: Installation of the horizontal lifeline system shall be performed by a contractor with experienced in not less than 5 installations and shall be certified by the manufacturer as an approved installer. The installation contractor shall maintain Commercial General and Excess Liability insurance coverage of not less than \$1 million per occurrence, \$4 million aggregate.

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PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304 or 316 alloy, using manufacturer's recommended stainless steel specification.
- B. Structural Steel: ASTM A36, ASTM A500 Grade B for design and fabrication of supplementary structural steel stanchions.
- C. Fasteners:
 - 1. Furnish bolts in conformance with ASTM A-325 Type I with one hardened washer and heavy hex nut.
 - a. Where surface of bolted part has a slope in excess of 1:20, furnish beveled washer.
 - b. When installation is subject to repeat vibration, bolted fasteners shall be furnished with prevailing torque lock nuts.

2.2 COMPONENTS

- A. Horizontal Lifeline System: cable, end brackets, splices, intermediate supports, turnbuckles, lanyard coupler devices and cable terminations shall be stainless steel Type 316.
- B. Lanyard: As recommended by fall protection system manufacturer and as follows:
 - 1. Comply with OSHA 1926.500 and ANSI Z359.1-1992
 - 2. Nylon; "Y" lanyard; 6 ft length; tear out shock absorbing; double locking snap assemblies at each end.
 - 3. Quantity: 6.
- C. Support Harness: Nylon; Class III full body harness with back D ring.
 - 1. Quantity: 6.
- D. Rescue: Appropriate and necessary hardware to perform assisted and unassisted rescues in the event of a fall.
- E. Accessories: As required for complete installation.

2.3 FABRICATION

- A. Fabricate fall protection systems assemblies to meet "Design" and "Performance Requirements" specified.
- B. Welding to comply with AWS D1.1.
- C. System components to be of same material unless otherwise required.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the support structure and conditions under which work is to be installed. Notify Engineer in writing of unsatisfactory dimensions or conditions. Proceed with installation only after unsatisfactory dimensions and conditions have been corrected in a manner acceptable to installer.

3.2 INSTALLATION

- A. Install fall protection system work in accordance with the approved shop drawings, manufacturer's written instructions, the original design, and all pertinent regulations and codes, anchoring all components firmly into position to meet requirements of this Section.
- B. Coordination:
 - 1. Coordinate installation to ensure non-interference with electrical, HVAC, theatrical and other obstructions.
- C. Temporary Fall Protection:
 - 1. Furnish OSHA approved temporary fall protection to safeguard workers during installation.
- D. Installation to be performed by contractor certified to install manufacturers system.
- E. After system installation and tensioning, inspect and operate the system and make final adjustments for proper operation.
- F. Conduct final inspection to verify all work installed correctly and in accordance with Contract Documents and all installed products function properly.

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3.3 TRAINING

- A. Owner's designated operators in proper use of the fall protection system. Provide at least one 3 hr training session conducted at the installation. Training to include classroom and in-place training.
- B. Train Owner's designated operators in the proper rescue techniques and use and care of associated equipment.

END OF SECTION

SECTION 12 24 13

ROLLER WINDOW SHADES

PART 1 – GENERAL

- 1.1 [RELATED DOCUMENTS](#)
- 1.2 [SUMMARY](#)
- 1.3 [ACTION SUBMITTALS](#)
- 1.4 [INFORMATIONAL SUBMITTALS](#)
- 1.5 [CLOSEOUT SUBMITTALS](#)
- 1.6 [QUALITY ASSURANCE](#)
- 1.7 [DELIVERY, STORAGE, AND HANDLING](#)
- 1.8 [FIELD CONDITIONS](#)

PART 2 – PRODUCTS

- 2.1 [MANUFACTURERS](#)
- 2.2 [MANUAL ROLLER SHADES \(WT-2A\)](#)
- 2.3 [MOTOR-OPERATED ROLLER SHADES \(WT-1A\)](#)
- 2.4 [SHADEBAND MATERIALS](#)
- 2.5 [ROLLER-SHADE FABRICATION](#)

PART 3 – EXECUTION

- 3.1 [ROLLER-SHADE INSTALLATION](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Manually operated roller shades with single rollers.
 - 2. Motor-operated roller shades with single rollers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
 - 1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.
- C. Samples for Verification: For each type of roller shade.
 - 1. Shadeband Material: As indicated. Mark inside face of material if applicable.
 - 2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
 - 3. Installation Accessories: Full-size unit, not less than 10 inches long.
- D. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Product test reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1 **1.6 QUALITY ASSURANCE**

- 2 A. Installer Qualifications: Fabricator of products.
3 B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic
4 effects, and to set quality standards for materials and execution.
5 1. Approval of mockups does not constitute approval of deviations from the Contract Documents
6 contained in mockups unless Architect specifically approves such deviations in writing.
7 2. Subject to compliance with requirements, approved mockups may become part of the completed
8 Work if undisturbed at time of Substantial Completion.

9 **1.7 DELIVERY, STORAGE, AND HANDLING**

- 10 A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of
11 installation using same designations indicated on Drawings.

12 **1.8 FIELD CONDITIONS**

- 13 A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces,
14 including painting, is complete and dry and ambient temperature and humidity conditions are maintained at
15 the levels indicated for Project when occupied for its intended use.
16 B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of
17 other construction by field measurements before fabrication and indicate measurements on Shop
18 Drawings. Allow clearances for operating hardware of operable glazed units through entire operating
19 range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule
20 with construction progress to avoid delaying the Work.

21 **PART 2 - PRODUCTS**

22 **2.1 MANUFACTURERS**

- 23 A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
24 1. Hunter Douglas.
25 2. Lutron Electronics Co., Inc.
26 3. MechoShade Systems, Inc.
27 4. Nysan Solar Control Inc.; a Hunter Douglas company.
28 5. Springs Window Fashion.

29 **2.2 MANUAL ROLLER SHADES (WT-2A)**

- 30 A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade
31 movement when bead chain is released; permanently adjusted and lubricated.
32 1. Bead Chains: Nickel-plated metal.
33 a. Loop Length: Full length of roller shade.
34 b. Limit Stops: Provide upper and lower ball stops.
35 c. Chain-Retainer Type: Clip, jamb mount.
36 2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting
37 heavy roller shades.
38 a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by
39 manufacturer, whichever criteria are more stringent.

40 **2.3 MOTOR-OPERATED ROLLER SHADES (WT-1A)**

- 41 A. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and
42 with features, characteristics, and accessories suitable for conditions indicated, complete with electric
43 motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and
44 operating parts, and accessories required for reliable operation without malfunction. Include wiring from
45 motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with
46 building electrical system.
47 1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency,
48 and marked for intended location and application.
49 2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.
50 a. Electrical Characteristics: Single phase, 110 V, 60 Hz.
51 3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush
52 mounting. Provide the following for remote-control activation of shades:

- 1 a. Individual/Group Control Station: Maintained-contact, three-position, rocker-style, wall-
2 switch-operated control station with open, close, and center off functions for individual and
3 group control.
4 b. Color: As selected by Architect from manufacturer's full range.
5 4. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades
6 automatically at fully raised and fully lowered positions.
7 B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required
8 to accommodate operating mechanisms and weights and widths of shadebands indicated without
9 deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to
10 facilitate removal of shadebands for service.
11 C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly,
12 operating mechanism, installation accessories, and mounting location and conditions indicated.
13 D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three
14 inline rollers that are operated by one roller drive-end assembly.

15 **2.4 SHADEBAND MATERIALS**

- 16 A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing
17 agency. Identify products with appropriate markings of applicable testing agency.
18 B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
19 1. Source: Roller-shade manufacturer.
20 2. Roll Width: As required – no seams.
21 3. Orientation on Shadeband: Up the bolt.
22 4. Shading: 5% Openness.
23 5. Color: GreenScreen Evolve HD3505, Shale.

24 **2.5 ROLLER-SHADE FABRICATION**

- 25 A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements
26 for flexible, chain-loop devices; lead content of components; and warning labels.
27 B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
28 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which
29 shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to
30 head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus
31 1/8 inch.
32 2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of
33 end-to-end installations at centerlines of mullion or other defined vertical separations between
34 openings.
35 3. Railroaded Materials: Railroad material where material roll width is less than the required width of
36 shadeband and where indicated. Provide battens and seams as required by railroaded material to
37 produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located
38 at top of shadeband.

39 **PART 3 - EXECUTION**

40 **3.1 ROLLER-SHADE INSTALLATION**

- 41 A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for
42 installation tolerances, operational clearances, and other conditions affecting performance of the Work.
43 B. Proceed with installation only after unsatisfactory conditions have been corrected.
44 C. Electrical Connections: Connect motor-operated roller shades to building electrical system.
45 D. Install roller shades level, plumb, and aligned with adjacent units, according to manufacturer's written
46 instructions.
47 E. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction
48 throughout entire operational range.
49 F. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

50 **END OF SECTION**

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SECTION 12 36 13 - CONCRETE COUNTERTOPS

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- 2 PART 1 – GENERAL
- 3 [1.1 RELATED DOCUMENTS](#)
- 4 [1.2 SUMMARY](#)
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- 6 [1.5 INFORMATIONAL SUBMITTALS](#)
- 7 [1.7 CLOSEOUT SUBMITTALS](#)
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- 12 [2.1 PERFORMANCE REQUIREMENTS](#)
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- 20 [3.4 INSTALLATION OF COUNTERTOPS](#)
- 21 [3.5 ADJUSTING AND CLEANING](#)

22 **PART 1 - GENERAL**

23 **1.1 RELATED DOCUMENTS**

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

26 **1.2 SUMMARY**

- 27 A. Section includes concrete countertops (**CCT-1**).
- 28 B. Related Requirements:
- 29 1. Section 12 36 40 "Simulated Concrete Countertops" for cultured-marble countertops.
 - 30 2. Section 12 36 61.19 "Quartz Agglomerate Countertops" for quartz-agglomerate countertops.

31 **1.3 ACTION SUBMITTALS**

- 32 A. Product Data: For each concrete mix, concrete accessory and manufactured product.
- 33 B. Sustainable Design Submittals:
- 34 1. Product Certificates: For regional materials, indicating location of material manufacturer and point of
35 extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each
36 regional material.
 - 37 2. Product Data: For adhesives, indicating VOC content.
 - 38 3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting
39 materials.
- 40 C. Shop Drawings:
- 41 1. Include plans, sections, details, and attachments to other work.
 - 42 2. Show locations and details of joints.
 - 43 3. Show direction of directional pattern.
- 44 D. Samples for Verification: For each type indicated, in sets of Samples not less than 12 inches square.

45 **1.4 INFORMATIONAL SUBMITTALS**

- 46 A. Qualification Data: For fabricator.
- 47 B. Material Test Reports:
- 48 1. Physical and performance properties of cast concrete material.
 - 49 2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants
50 will not stain or damage concrete.

51 **1.5 CLOSEOUT SUBMITTALS**

- 52 A. Maintenance Data: For countertops to include in maintenance manuals. Include product data for care
53 products used or recommended by Installer, and names, addresses, and telephone numbers of local
54 sources for products.

- 1 **1.6 QUALITY ASSURANCE**
- 2 A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to
- 3 that required for this Project, and whose products have a record of successful in-service performance.
- 4 B. Installer Qualifications: Fabricator of countertops.
- 5 **1.7 DELIVERY, STORAGE, AND HANDLING**
- 6 A. Store and handle cast concrete and related materials to prevent deterioration or damage due to moisture,
- 7 temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
- 8 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move, if required,
- 9 using dollies with cushioned wood supports.
- 10 2. Store cast concrete countertops on wood A-frames or pallets with nonstaining, waterproof covers.
- 11 Arrange to distribute weight evenly and to prevent damage to concrete. Ventilate under covers to
- 12 prevent condensation.
- 13 **1.8 FIELD CONDITIONS**
- 14 A. Field Measurements: Verify dimensions of construction to receive concrete countertops by field
- 15 measurements before fabrication and indicate measurements on Shop Drawings.

16 **PART 2 - PRODUCTS**

- 17 **2.1 PERFORMANCE REQUIREMENTS**
- 18 A. Countertops: Products shall meet or exceed the following performance characteristics:
- 19 1. Accelerated Weathering: ASTM G 155, passed, 2,000 hours; no deleterious effects, no cracking,
- 20 checking, crazing, erosion, rusting, blistering, peeling or delaminating.
- 21 2. Freeze/Thaw Resistance: ICC AC 219, passed, 10 cycles; no deleterious effects, no cracking,
- 22 checking, crazing, erosion, rusting, blistering, peeling or delaminating.
- 23 3. Water Absorption: ASTM C 1185, < 4%, passed; no deleterious effects, no cracking, checking,
- 24 crazing, erosion, rusting, blistering, peeling or delaminating.
- 25 4. Tensile Adhesion: ASTM C 297, 25 PSI, Minimum 15 PSI.
- 26 5. Water Resistance: ASTM D 2247, passed, passed 14 days; no deleterious effects, no cracking,
- 27 checking, crazing, erosion, rusting, blistering, peeling or delaminating
- 28 6. Salt Spray: ASTM B 117, no deleterious effect, passed at 300 hours; no deleterious effects, no
- 29 cracking, checking, crazing, erosion, rusting, blistering, peeling or delaminating.
- 30 7. Surface Burning Characteristics: ASTM E 84, 0 Flame Spread/ 0 Smoke Develop, passed.
- 31 8. Compressive Strength: ASTM C 39, < 7,000 PSI, passed.
- 32 9. Flexural Strength: ASTM C 1185/1186, <1,560 PSI, passed.
- 33 **2.2 MANUFACTURERS**
- 34 A. Concrete Countertops Basis of Design: Envision Concrete Countertops by Tuscan ConcreteWorx as
- 35 fabricated and installed by local dealer:
- 36 1. Lutz Company: (763) 315-5886. 8801 Xylon Avenue North, Brooklyn Park, MN 55445.
- 37 2. Architectural Building Systems, Inc. (913) 281-3363. 4001A Kaw Drive, Kansas City, KS 66102.
- 38 **2.3 CONCRETE COUNTERTOPS (CONC-3)**
- 39 A. Concrete Countertops:
- 40 1. Type: Factory pre-fabricated lime concrete-based concrete countertops composed of minerals,
- 41 cement, resin, reinforcing fibers and admixtures. Meet criteria specified in Paragraph: Performance
- 42 Requirements.
- 43 2. Casting: Individual pieces cast using HDO, melamine, rubber or fiberglass manufactured molds.
- 44 3. Size and Configuration: As indicated on the Drawings.
- 45 4. Thickness: Foam core with 1 inch of Envision Concrete Countertop Mix.
- 46 5. Thickness: As indicated on the Drawings.
- 47 6. Integral Color: As indicated on the Drawings.
- 48 7. Finish: Polished.
- 49 8. Edge: Eased.
- 50 B. Accessories: Acceptable to the countertop manufacturer and as follows.
- 51 1. Standard Base Adhesive: Liquid Nails Construction Adhesive.
- 52 2. Joining Materials.
- 53 3. Attachment Adhesives: Construction adhesive recommended by manufacturer.
- 54 4. Surface Sealer.

- 1 C. Splashes: Provide 3/4-inch-thick **[backsplashes] [and] [end splashes]** unless otherwise indicated.
2 1. Height: **[4 inches]** [As indicated] <Insert dimension>.
3 2. Top-Edge Detail: [Straight, slightly eased at corner] **[3/8-inch bevel] [3/4-inch radius] [3/8-inch**
4 **radius]** [As indicated].
5 D. Joints: Fabricate countertops in sections for joining in field[, **with joints at locations indicated]**.
6 1. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less
7 than 36 inches long may result, unless unavoidable.
8 2. Joint Type: Bonded, 1/32 inch or less in width.
9 3. Joint Type: Grouted, 1/16 inch in width.
10 4. Joint Type: Sealant-Filled, 1/16 inch in width.
11 5. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain
12 alignment of surfaces at joints where indicated. Make width of cuts slightly more than thickness of
13 splines to provide snug fit. Provide at least three splines in each joint.
14 E. Cutouts and Holes:
15 1. Undercounter Fixtures: Make cutouts for undercounter fixtures in shop using template or pattern
16 furnished by fixture manufacturer. Form cutouts to smooth, even curves.
17 a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces
18 of countertop and projecting 3/16 inch into fixture opening.
19 b. Provide vertical edges, rounded to 3/8-inch radius at juncture of cutout edges with top surface
20 of countertop, slightly eased at bottom, and projecting 3/16 inch into fixture opening.
21 c. Provide 3/4-inch full bullnose edges projecting 3/8 inch into fixture opening.
22 2. Counter-Mounted Fixtures: Prepare countertops in shop for field cutting openings for counter-
23 mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner
24 holes of largest radius practical.
25 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar
26 items.

27 **2.4 ADHESIVES, GROUT, SEALANTS, AND ACCESSORIES**

- 28 A. General: Use only adhesives formulated for concrete and that are recommended by their manufacturer for
29 the application indicated.
30 B. Joint Splines: Stainless-steel or brass washers approximately 1 inch in diameter and of thickness to fit snugly
31 in saw-cut kerf in edge of cast units.
32 C. Cleaner: Specifically formulated for types, finishes, and applications indicated, as recommended by
33 manufacturer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.

34 **PART 3 - EXECUTION**

35 **3.1 EXAMINATION**

- 36 A. Examine substrates to receive countertops and conditions under which countertops will be installed, with
37 Installer present, for compliance with requirements for installation tolerances and other conditions affecting
38 performance of concrete countertops.
39 B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of countertops.
40 C. Proceed with installation only after unsatisfactory conditions have been corrected.

41 **3.2 PREPARATION**

- 42 A. Advise installers of other work about specific requirements for placement of inserts and similar items to be
43 used by countertop Installer for anchoring concrete countertops. Furnish installers of other work with
44 Drawings or templates showing locations of these items.
45 B. Before installing countertops, clean dirty or stained concrete surfaces by removing soil, stains, and foreign
46 materials. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives and
47 rinse with clear water. Allow material and surfaces to dry before installing.

48 **3.3 CONSTRUCTION TOLERANCES**

- 49 A. Variation from Level: Do not exceed 1/8 inch in 96 inches, 1/4 inch maximum.
50 B. Variation in Joint Width: Do not vary joint thickness more than one-fourth of nominal joint width.
51 C. Variation in Plane at Joints (Lipping): Do not exceed 1/64-inch difference between planes of adjacent units.
52 D. Variation in Line of Edge at Joints (Lipping): Do not exceed 1/64-inch difference between edges of adjacent
53 units, where edge line continues across joint.

- 1 **3.4 INSTALLATION OF COUNTERTOPS**
2 A. General: Install in strict accordance with manufacturer's recommendations including the following.
3 1. Inspect countertops and trim as delivered to ensure that materials are as specified.
4 2. Dry fit all adjoining pieces, and install using adhesive, filler and dowels as necessary.
5 3. Comply with drawings and manufacturer's drawings for location of pieces and joints.
6 4. Use diamond saw or diamond grinding if required for field-fitting.
7 5. Comply with adhesive manufacturer's preparation and installation instructions.
8 6. Adhere countertop to substrate using construction adhesive. Maintain temperatures above 40
9 degrees F (9 degrees C) for at least 12 hours.
10 7. Apply sealer and wax in accordance with manufacturer's recommendations.
- 11 **3.5 ADJUSTING AND CLEANING**
12 A. In-Progress Cleaning: Clean countertops as work progresses. Remove adhesive, grout, mortar, and sealant
13 smears immediately.
14 B. Remove and replace countertops of the following description:
15 1. Broken, chipped, stained, or otherwise damaged. Concrete may be repaired if methods and results
16 are approved by Architect.
17 2. Defective countertops.
18 3. Defective joints, including misaligned joints.
19 4. Interior countertops and joints not matching approved Samples and mockups.
20 5. Interior countertops not complying with other requirements indicated.
21 C. Replace in a manner that results in concrete countertops matching approved Samples, complying with other
22 requirements, and showing no evidence of replacement.
23 D. Clean countertops no fewer than six days after completion of installation, using clean water and soft rags.
24 Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or
25 other materials or methods that may damage concrete.
26 E. Sealer Application: Apply sealer to comply with concrete producer's and sealer manufacturer's written
27 instructions.
28

END OF SECTION 12 36 40

SECTION 12 36 61
SIMULATED STONE COUNTERTOPS

1
2
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13 [2.3 COUNTERTOP MATERIALS](#)
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16 **PART 1 - GENERAL**

17 **1.1 RELATED DOCUMENTS**

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

20 **1.2 SUMMARY**

- 21 A. Section Includes:
22 1. Solid-surface-material countertops and backsplashes.
23 2. Quartz agglomerate countertops and backsplashes.

24 **1.3 ACTION SUBMITTALS**

- 25 A. Product Data: For countertop materials.
26 B. Sustainable Design Submittals:
27 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content
28 and cost.
29 2. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
30 3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting
31 materials.
32 4. Product Data: For composite wood products, indicating that product contains no urea
33 formaldehyde.
34 5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements
35 for low-emitting materials.
36 C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of
37 joining, and cutouts for plumbing fixtures.
38 D. Samples: For each type of material exposed to view.

39 **1.4 QUALITY ASSURANCE**

- 40 A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-
41 accredited certification body.
42 B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification
43 body.

44 **1.5 PROJECT CONDITIONS**

- 45 A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are
46 installed but before countertop fabrication is complete.

47 **1.6 COORDINATION**

- 48 A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

1 **PART 2 - PRODUCTS**

2 **2.1 SOLID-SURFACE-MATERIAL COUNTERTOPS**

- 3 A. Configuration: Provide countertops with the following front and backsplash style:
- 4 1. Front: Straight, slightly eased at top
 - 5 2. Backsplash: Straight, slightly eased at corner.
 - 6 3. Endsplash: Matching backsplash
- 7 B. Countertops: 1/2-inch-with front edge built up with same material].
- 8 C. Backsplashes: 1/2-inch-thick, solid surface material.

9 **2.2 QUARTZ AGGLOMERATE COUNTERTOPS (SSF-#)**

- 10 A. Configuration: Provide countertops with the following front and backsplash style:
- 11 1. Front: Refer to Drawings.
 - 12 2. Backsplash: Refer to Drawings.
 - 13 3. Endsplash: Refer to Drawings.
- 14 B. Countertops: 3/4-inch thick, quartz agglomerate with front edge built up with same material.
- 15 C. Backsplashes: 3/4-inch-thick, quartz agglomerate.

16 **2.3 COUNTERTOP MATERIALS**

- 17 A. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of
18 Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions
19 from Indoor Sources Using Environmental Chambers."
- 20 B. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
- 21 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products
22 that may be incorporated into the Work include, but are not limited to, the following:
 - 23 a. E. I. du Pont de Nemours and Company.
 - 24 b. Formica Corporation.
 - 25 c. LG Chemical, Ltd.
 - 26 d. Silestone by Cosentino
 - 27 e. Wilsonart International.
 - 28 2. Colors and Patterns: As selected by Architect from manufacturer's full range.
- 29 C. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled
30 plastic resin and complying with the "Physical Characteristics of Materials" Article of ANSI SS1.
- 31 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products
32 that may be incorporated into the Work include, but are not limited to, the following:
 - 33 a. Caesarstone
 - 34 b. Cosentino USA. (Silestone)
 - 35 2. Colors and Patterns: Match Architect's samples.
 - 36 a. **SSF-1:** Caesarstone: 4120 Raven.
 - 37 b. **SSF-2:** Caesarstone: 6141 Ocean Foam.

38 **PART 3 - EXECUTION**

39 **3.1 INSTALLATION**

- 40 A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m).
- 41 B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Align
42 adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with
43 manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean
44 entire surface.

45 **END OF SECTION**

SECTION 13 34 13

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GREENHOUSE & GREENHOUSE RELATED EQUIPMENT

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 - 3.13 ENVIRONMENTAL CONTROL SYSTEM
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 - 5.3 GROUTING
 - 5.4 FLASHING
 - 5.5 INSTRUCTION

1 **PART 1 - GENERAL**

2 **1.1 CONDITIONS**

- 3 A. It is the intent of this portion of the specifications to include the furnishing and erecting of the greenhouse
4 superstructure including all glazing, doors & door hardware, and ventilation as shown on plans and/or
5 hereinafter described such work to be the responsibility of the Greenhouse Manufacturer. Greenhouse
6 installation is the responsibility of the Greenhouse Manufacturer.
- 7 B. It is not the intent of this portion of the specifications to cover concrete, grouting, masonry work, plumbing,
8 electrical work (power and control wiring), utility connections, final cleaning of glazing, nor counter-flashing.
9 This portion shall be the responsibility of the General Contractor or his selected Subcontractors other than
10 the Greenhouse Manufacturer.
- 11 C. No masonry or foundation installation shall be made prior to approval of greenhouse drawings. Approved
12 greenhouse drawings shall be used to make all masonry and foundation installations. Dimensions may
13 vary slightly from contract drawings to accommodate manufacturer's standard, but total area shall not be
14 less than 98% of that shown.
- 15 D. Basis of Design (B.O.D.) systems and equipment (with the exception of the control system) are indicated
16 as the baseline design per section 2.1 B below. Alternate systems/equipment shall match the BOD at a
17 minimum, and offer the same or better warranty, and shall be fully coordinated with all other systems
18 interfacing with them. These shall be reviewed and approved by City of Madison Engineering and Olbrich
19 Botanical Garden Conservatory staff. Greenhouse manufacturer assumes full responsibility for the
20 performance of their design to meet the BOD and contract intent.

21 **1.2 WORK INCLUDED**

- 22 A. These specifications are intended to supplement the drawings and, therefore, it shall not be their purpose
23 to mention any portion of the construction which the drawings are competent to explain and such
24 omissions shall not relieve the Greenhouse Manufacturer from carrying out such portions indicated only on
25 the drawings and should items be required by specifications which are not indicated on the drawings, they
26 shall be supplied and installed by this Contractor.

27 **1.3 RELATED WORK IN OTHER SECTIONS**

- 28 A. This section includes coordination with related work in the following sections:
- 29 1. Division 3 Section "Concrete floors"
 - 30 2. Division 3 Section "Grouting of sills and base plates"
 - 31 3. Division 4 Section "Masonry walls"
 - 32 4. Division 22 Section "Plumbing rough-in work, hook-up of greenhouse plumbing systems,
33 downspouts"
 - 34 5. Division 26 Section "Electrical, environmental control system wiring, lighting, growth lighting (HPS,
35 LED) conduit and hook-ups of greenhouse electrical equipment"

36 **1.4 SUBMITTALS**

- 37 A. Within ten days after award of contract, submit approval drawings in quantities as required by Division 1 -
38 General Conditions.
- 39 B. Approval submittals shall include structurally engineered stamped drawings for state of Wisconsin, a full
40 set of engineering calculations, equipment submittal and a full warranty per Paragraph 1.7 of this
41 specification. Submittals without this warranty will not be reviewed.
- 42 C. Approval drawings shall include the following detailed information:
- 43 1. Cover Sheet
 - 44 2. Floor/ Post Plan
 - 45 3. Post Feet Details
 - 46 4. Roof Framing Plan
 - 47 5. Roof Glazing Plan
 - 48 6. Sidewall Elevations
 - 49 7. Gable Elevations
 - 50 8. Partition Elevations
 - 51 9. Aluminum Truss
 - 52 10. Foundation Outline & Greenhouse Structural Loads
 - 53 11. Equipment Plan & Section with Electrical Loads
 - 54 12. Bench Layout & Irrigation Plan
 - 55 13. Double Vent Ridge Section
 - 56 14. Typical Sidewall Sections
 - 57 15. Roof to Gable Section

- 1 16. Misc. Closure Details (greenhouse to head house/building)
- 2 17. Door & Door Hardware Schedule
- 3 18. Heating System Plans & Details

4 **1.5 QUALITY ASSURANCE**

- 5 A. The greenhouses shall be erected by the manufacturer or their qualified greenhouse specialty contractor
- 6 with at least five (5) years of experience in building greenhouses of the type specified, similar in size and
- 7 complexity.
- 8 B. The BOD (basis of design) is based on the specific manufacturers/models specified in this section. Any
- 9 deviation from these named manufacturers/models will affect the performance of the greenhouse. If
- 10 substitute equipment manufacturers/models are approved prior to the bid opening and included in bid, the
- 11 performance of the greenhouse shall be the responsibility of the bidding greenhouse manufacturer.

12 **1.6 DELIVERY, STORAGE AND HANDLING**

- 13 A. Greenhouse supplier shall deliver greenhouse and greenhouse related equipment to the job site unless
- 14 otherwise specified.

15 **1.7 WARRANTY**

- 16 A. Greenhouse Manufacturer shall provide a one (1) year warranty on materials and workmanship from date
- 17 of substantial completion. Any greenhouse warranty item within the warranty period shall be directed to
- 18 and be the direct responsibility of the Greenhouse Manufacturer, including that of its material suppliers,
- 19 vendors and subcontractors.
- 20 B. Written sample warranty conforming to the above paragraph to be submitted as a part of the approval
- 21 drawing submittal package.

22 **PART 2 - PRODUCTS**

23 **2.1 MANUFACTURER**

- 24 A. Drawings and specifications are based on THE GLASS HOUSE as manufactured by Rough Brothers,
- 25 5513 Vine Street, Cincinnati, Ohio 45217, (1-513-242-0310).
- 26 B. The following manufacturers have been pre-approved by the City of Madison. No additional alternates
- 27 shall be considered.
- 28 1. Albert J. Lauer Inc.; Farmington, MN.
- 29 2. Nexus Corporation; Northglenn, CO
- 30 C. All specified equipment manufacturers/models here in named shall be the Basis of Design (BOD) except
- 31 for the Wadsworth Control system.

32 **2.2 MATERIALS**

- 33 A. Structure shall be designed and detailed according to good engineering practice by a structural engineer
- 34 licensed in the State of the Wisconsin. Structural engineering shall be project and location specific. All
- 35 primary framing shall be 6005 or 6061-T6 and 6063-T6 alloys. All aluminum flashing shall be 5005 H14
- 36 alloy. Framing shall consist of aluminum trusses on 12'-0" centers spanning the full width of the structure
- 37 with a 6/12 roof pitch. Aluminum shall be mill finish with appropriate heat treatment. No castings, either of
- 38 aluminum or aluminum alloy, shall be permitted for joining structural members at joints subject to stress in
- 39 which tensile strength is a factor.
- 40 B. Sidewall columns shall be attached to top of foundation wall/kneewall or pier with adhesive set 316
- 41 stainless steel anchor bolts. Drilling for anchors and setting of anchor bolts to be by the Greenhouse
- 42 Manufacturer.
- 43 C. Structural connections shall be made with galvanized steel bolts. All bolts 1/4" diameter up to 1/2" diameter
- 44 shall be A307. All bolts 1/2" diameter or larger shall be Grade 5.
- 45 D. Aluminum welding shall be performed by a certified welder with Welder Performance Qualifications (WPQ
- 46 – See QW-301, Section IX, ASME Boiler and Pressure Vessel Code).

47 **2.3 STANDARD DESIGN CRITERIA**

- 48 A. Refer to drawings for current building code and loading information for specific jobsite location.
- 49 B. In addition to the above, roof bars shall be required to carry a 100 lb. Concentrated load at the center of
- 50 any span.
- 51 C. Structure shall be designed in accordance with current Aluminum Association "Specifications for Aluminum
- 52 Structures". The maximum allowable deflection shall be L/120 of the span. Structure shall include
- 53 adequate bracing for the lateral support of structural members and framing, and for stability of the structure

1 for the resistance to wind forces. Bottom chord members as well as other truss members shall be
2 adequate to resist compressive loads produced by horizontal wind loads and roof uplift produced by wind.

3 **2.4 EXPANSION CONTROL**

4 A. Suitable expansion joints shall be provided in all longitudinal members to take care of the longitudinal
5 expansion in the aluminum. No longitudinal members shall exceed 21 0". All members shall be so joined
6 as to require each joint to handle the expansion in the individual member and to prevent an accumulation
7 of expansion in several members in one direction.

8 **2.5 ALUMINUM FRAMES**

- 9 A. Truss members and connection plates shall be aluminum. Special care shall be taken in the fabrication of
10 this aluminum work, and all tolerances shall be held to an absolute minimum in order to secure proper fit of
11 the aluminum members specified.
- 12 B. Aluminum columns shall be furnished and placed through the length of the greenhouse and across all
13 partitions and gables as required. Columns shall be factory punched, or drilled to attach required aluminum
14 members.
- 15 C. Trusses shall be connected to the sidewall columns by an aluminum plate so designed as to be bolted to
16 the web of the column with all bolts in shear. No joint shall be allowed, either of combined extrusions or a
17 casting that shall be fastened to the flange of the column thereby placing fasteners in tension or twist.
- 18 D. Aluminum rafters shall be furnished and placed in the roof of the greenhouse, extending from the eave or
19 gutter to the ridge. Each pair of rafters shall be connected together at the ridge by means of aluminum
20 plates.
- 21 E. Aluminum purlins in the roof, of the size required shall be furnished and connected to supporting members
22 with a minimum of two galvanized steel bolts into each member. Purlins shall be prefabricated before
23 shipment for the attachment of glazing bars and purlin clips.
- 24 F. Provide all other mill-finished aluminum structural components; such as bracing, clips, and fasteners not
25 mentioned above but required to complete the framework of the greenhouse.

26 **2.6 GUTTER**

- 27 A. An extruded aluminum gutter, 7 ½" wide x 2 ¾" deep, with extruded drip gutter and internal downspout
28 connections shall be provided where indicated on the drawings. This member shall have a flange to
29 receive glazing bars and shall be provided with weep holes to carry condensation collected from the
30 underside of the roof to the drip gutter. Gutter to include safety foot treads as a safety factor. Gutters
31 without integral extruded safety tread shall not be accepted.
- 32 B. Connections for gutter downspouts shall be provided where indicated on drawings. Final connection and
33 downspout material covered in other section.

34 **2.7 RIDGE**

- 35 A. An extruded aluminum ridge shall be furnished and placed at the peak of the structure. Ridge shall be
36 provided with continuous socket hinge to receive ridge vents or fixed roof glazing.

37 **2.8 GABLES**

- 38 A. Glass gables with fixed gables from sill to gable rafter shall be constructed in a similar manner to the roof
39 and sides using extruded aluminum shapes. All gable glass shall be lapped 3/8" similar to roof glazing.

40 **2.9 GABLE END RAFTER**

- 41 A. Specially extruded gable and corner trim shall be provided to receive roof glazing bar, vertical side and
42 gable glazing and glazing bars. The gable and corner trim shall be neatly mitered and spliced at the ridge
43 and at the eave or gutter to provide a smooth detail at this point. These shall be securely fastened to the
44 structural members, forming the gable end.

45 **2.10 WALL AND VENT SILLS**

- 46 A. Extruded aluminum sills shall be provided where required. Sills shall be capable of receiving side vents or
47 fixed glazing. Sill corners shall be shop welded.

48 **2.11 GLAZING BARS**

- 49 A. Extruded aluminum glazing bars shall be placed and spaced on 24" centers to properly receive glass 23
50 1/4" wide. A chamber shall be provided on both the top and bottom of this bar for fastening purposes.
- 51 B. Condensation gutters to conduct primary condensation to a suitable disposal point shall be provided.
52 Glazing bars shall extend in one piece from the ridge to the eave or gutter. In order to prevent secondary
53 condensation on the underside of the roof bars from collecting at purlin points, roof bars shall cross purlins

1 with the entire underside of the bar raised to a minimum of 3/8" above the top flange of the purlin. This will
2 allow the condensation to pass to a suitable collection point at the side of the enclosure. Rafter straps for
3 fastening roof bars to purlins in the above manner shall be of extruded aluminum. Washers of plastic or
4 other material placed between the roof bars and purlins to raise the bars off the purlins shall not
5 acceptable as a substitute method of secondary condensation control.

6 **2.12 KNEEWALL/CURB SILL FLASHING**

7 A. Aluminum sill flashing shall be placed on the outside of the perimeter kneewall. Sill flashing shall be
8 placed under the glazing sill member and to the outside of the greenhouse columns, covering the top of
9 the exposed kneewall and curb including any insulation and/or face veneer, if present. Aluminum sill
10 flashing shall extend no less than 2" down the vertical face of the kneewall. Sill flashing kneewalls shall be
11 a minimum 1/16" thick. All sill corner flashing shall be shop welded. All sill flashing and end flashing
12 conditions at door openings shall be shop welded closures matching the profile of the sill flashing. All sill
13 flashing to be laid end to end with a .032 x4" long splice cap matching the profile of the sill flashing. Splice
14 cap to be set in sealant and held in place with pop-rivets. Lapped sill flashing at joints is not acceptable.

15 **2.13 CLOSURE FLASHING**

16 A. Aluminum closure flashing shall be placed on along the walls and roof of the main building, per drawings.
17 Aluminum closure flashing to adjacent structures shall be a minimum 1/16" thick.

18 **2.14 ROOF VENTS**

19 A. Automatic 36" ridge vents with a continuous socket hinge shall be furnished and arranged to open out.
20 Vents for any given compartment, when assembled and installed, shall be continuous from one end to the
21 other. Ridge vents shall be made up of a top rail, bottom rail, and mullions of extruded aluminum. They
22 will then be bolted together in accordance with the manufacturer's instruction.
23 B. All vents shall have provision made at the hinge point to prevent creeping of the vents.

24 **2.15 VENT OPERATORS**

25 A. All roof vents shall be operated with aluminum or steel rack arms with zinc pinions.
26 B. Provide 14 gauge 1.315" diameter galvanized drive shaft with aluminum couplings.
27 C. Aluminum shaft hangers with DELRIN bushings shall be provided to support roof and side vent drive shaft.
28 D. Rack & pinion arms with aluminum/ steel rack, zinc pinion gear and extruded aluminum housing assembly
29 to keep rack and pinions in proper mesh and alignment shall be provided. Racks attach to bottom rail of
30 vents with aluminum clips and stainless steel cotter pins. No less than two sets of rack and pinion arms
31 shall be provided for each bay per run of vents.

32 **2.16 VENT MACHINES**

33 A. Lock EWA Series vent machines shall be used to operate motorized ridge vents. Vents machines to have
34 line voltage limits.

35 **2.17 SCREENS**

36 A. Screens shall be provided at all ridge vent openings and over evaporative pads in corridor.
37 1. Screen rails shall be 5/16" x 7/8" mill finish extruded aluminum with a groove to receive a vinyl
38 insert to hold 16 x 18 aluminum mesh in place.
39 2. Screen frames shall be assembled with die cast aluminum corners and designed to allow for re-
40 screening of units in the field.
41 3. Brush seals shall be provided at ends of screen frames in roof vents where vent operator arms
42 penetrate.
43 4. Screen shall be held in place by aluminum tracks located at the top and the bottom of the screens,
44 with no screws to hold the screen in place. For removal of screen frames, the intent is to shift the
45 screen frames up in the top track so that it clears the bottom track. Refer to details in drawings.
46 B. Screen box shall be provided over exterior shutters at the evaporative cooling pad system. Refer to
47 drawings for location.
48 1. Screen rails shall be 5/16" x 7/8" mill finish extruded aluminum with a groove to receive a vinyl
49 insert to hold 16 x 18 aluminum mesh in place.
50 2. Screen frames shall be constructed of welded 1/8" thick aluminum angle.

51 **2.18 GLAZING**

52 A. Roof
53 1. All roof glazing to be laminated glass consisting of (2) 1/8" clear annealed glass pieces with .030"
54 PVB inner layer. Nominal thickness to be 1/4".

- 1 B. Wall
2 1. All rectangle vertical glazing sized glass to be 1/8" clear tempered glass. All odd sized or sloped
3 cut glass to be 1/8" double strength or clear annealed glass.
4 2. All glass shall be laid with 3/8" lapped joints and held in place with aluminum bar caps to cover the
5 glazing, and prevent the glass from slipping.
6 3. Aluminum extruded bar caps shall be applied to the bar covering the entire length of each lite of
7 glass and made to conform to the laps in the glass and provide a uniform 3/8" lap. These caps
8 shall be fabricated from extruded aluminum, so fabricated to exert a uniform, but not excessive
9 pressure, along the entire length of the glass lite. Each cap shall be held with a minimum of two 1/2"
10 x #10 stainless steel hex head self-tapping screws. Screws which hold bar caps shall be spaced
11 not over 15 inches apart, nor shall any screw be placed closer than 1-1/2" from the end of the caps.
12 4. At each truss top chord and end rafters, scaffold screws, 1" x #12 round head stainless steel
13 screws shall be used to hold the caps in place, yet provide sufficient shank protruding above the
14 caps for support of scaffolding.
15 C. Glazing Compounds
16 1. Glass shall be bedded in extruded rope putty. The roof glass shall be caulked on top with a special
17 elastic glazing compound before the bar caps are applied.

18 **PART 3 - GREENHOUSE RELATED EQUIPMENT**

19 **3.1 EXHAUST FANS**

- 20 A. Exhaust fans shall be heavy-duty construction, consisting of a cast aluminum propeller having three (3) or
21 more Macheta® tip blades, and a formed fiberglass housing and exhaust cone, both having a smooth, gel
22 coat exterior surface.
23 B. BOD Fans use the Munters Drive direct drive motor system, consisting of the EC motor and motor drive
24 developed exclusively by Munters. Fans shall be protected against rust and corrosion with stainless steel
25 hardware, and aluminum struts. Fans shall be variable speed as scheduled on the drawings.
26 C. Fans used in this specification shall be performance certified by an independent testing facility such as
27 BESS Labs (University of Illinois) and shall list the appropriate test number on the fan.
28 D. Motorized, airfoil style shutters with aluminum blades shall be provided as part of each exhaust fan.
29 Shutter motor kits to include drive motor, crank arm, pull chain, return spring and hardware.
30 E. BOD Fans, wall housings, OSHA inlet and outlet guards shall be as manufactured and provided by
31 Aerotech, A Munters Company (Mason, MI).
32 F. Exhaust Fan Shutter shall be insulated motorized dampers for each exhaust fan. Refer to section 3.2
33 Motorized Dampers for requirements.
34 1. The following is for each damper :
35 a. Aluminum frame with formed flashing with x-bracing to prevent racking
36 b. 4"x4" SS Hager butt hinges on one side
37 c. (2) spring loaded Tight-Hold Draw Latches with 90 Degree T-Handle, Chrome-Plated Steel
38 by McMaster Carr on the other side
39 d. Foam seal tape around perimeter

40 **3.2 MOTORIZED DAMPERS**

- 41 A. Dampers shall be low leakage thermally insulated. Frame shall be thermally broken aluminum
42 construction with reverse flange mounting. The blades shall be parallel and extruded aluminum airfoil with
43 internal polyurethane foam and thermally broken. Blades shall be completely symmetrical relative to their
44 axle pivot point. Axle shall be 1/2" diameter plated steel with dual bearings with acetal inner sleeve, flanged
45 outer bearing resulting in no metal to metal or metal to plastic contact. Blade and jamb seals shall be
46 silicone rubber and external blade to blade linkage.
47 B. Dampers shall be mounted as shown on drawings.
48 C. BOD Dampers shall be operated by AFBUP actuators, by Belimo.
49 D. BOD Dampers shall be ICD-44, as manufactured and provided by Greenheck.

50 **3.3 EVAPORATIVE COOLING SYSTEM**

- 51 A. The BOD wet pad system shall consist of Munters celdek® evaporative cooling pad specially designed
52 with a cross fluted configuration of cellulose paper impregnated with insoluble anti-rot salts and stiffening
53 agent, MI-T-edg, on one side. The water distributor shall consist of extruded aluminum sections and water
54 deflectors with a rigid, 1/2" PVC pipe having metered outlet holes. The collection trough and water
55 deflectors shall be self-contained PVC. PVC end panels shall enclose the pads at the ends of all systems.

- 1 BOD Cooling system shall be CT Evaporative cooling system as manufactured by Aerotech, A Munters
2 Company, (Mason, MI).
3 B. Furnish and install standard plumbing package which includes float valve, strainer, union, ball valve and
4 piping between pump and water distributor, bleed off valve and tank overflow as manufactured by
5 Aerotech, A Munters Company.
6 C. A (submersible) pump of heavy duty construction featuring high volume at relatively low head pressure
7 shall be provided for each compartment and installed with a union in the discharge line for easy servicing.
8 The BOD pump shall be supplied by Aerotech, A Munters Company.
9 D. The BOD self-contained PVC system shall include a containment sump utilizing a 15" PVC tank connected
10 to the collection trough as manufactured by Aerotech, A Munters Company.
11 E. Furnish and install aluminum extruded 2 x 4 tube stringers and 0.032" aluminum flashing to prevent air
12 leaks around cooling system. Cooling system support framing shall be installed per Munters' installation
13 manual.
14 F. Furnish and install 1" pvc pipe from bleed off valve to floor drain in each zone, floor drain by others.
15 G. Furnish and install 1" pvc pipe from the tank overflow to floor drain in each zone, floor drain by others.
16 H. Furnish and install at each flush out valve, the following:
17 1. 1 1/2" PVC coupling SXS
18 2. 1 1/2" x 1 1/2" PVC bushing SPGxFPT
19 3. 3/4" x 1/2" brass adaptor MHTxMIP LF
20 4. 3/4" x brass cap FHT LF

21 3.4 HEATING

- 22 A. General description
23 1. Design requirements:
24 a. Inside Temperature Range: 42 °F – 65 °F (Refer to 3.4.D.2)
25 b. Outside Temperature: -15 °F
26 c. Temperature Difference: 57 °F to 80 °F
27 d. Wind: 15 MPH
28 B. System design: Hot water heating system to provide 100% of greenhouse system heating load.
29 C. General Requirements: The BOD heating system for the greenhouse shall be a Delta T Solutions Hot
30 Water Heating System. The system is designed under the following conditions for the peak load when
31 OAT is at -10°F and below:
32 1. Hot Water Supply: 160 °F
33 2. Hot Water Return: 130 °F to 140 °F
34 3. Temperature Differential: 20 °F to 30 °F
35 4. Relief Valve Pressure: 60 psi
36 5. Operating Pressure: 12 psi
37 D. General system description:
38 1. Hot water heating system with a variable flow supplied to the system based on the quantity zones
39 that have a heating demand. The hot water shall flow through radiating materials to control heat to
40 the desired temperature in each zone to supply a total BTUH of 2.16 million.
41 2. The system shall consist of the following heating zones in the Greenhouse that will be controlled
42 using the following components to maintain the desired min. night time zone temperatures:
43 a. Tropical Design Inside Temperature: 65 °F
44 b. Intermediate Orchid Design Inside Temperature: 62 °F
45 c. Cool Orchid Design Inside Temperature: 52 °F
46 d. Production Zone 1 Design Inside Temperature: 62 °F
47 e. Production Zone 2 Design Inside Temperature: 42 °F
48 f. Corridor Design Inside Temperature: 65 °F
49 g. Snow melt (consists of 3 loops)
50 3. Heating Source: The heat source that will be supplying the hot water to the radiating materials
51 shall be supplied by others (existing boiler system), with the required flow being supplied as per the
52 design drawing. Existing boiler system to accommodate 1:1 water to temperature ratio. The
53 sequence of operation is at -10°F OAT the HWS shall be 160°F and at 60 °F OAT the HWS shall
54 be 90 °F.
55 E. Fin Tube System Valves:
56 1. Zone Control: System flow shall be variable based on demand via a constant pressure reading –
57 VFD and sensing by the greenhouse control system. Designed flow rate shall be maintained per
58 active zone using an automatic flow control and 24V actuated two way zone control valve.
59 2. Control valves shall be manufactured by Belimo or approved equal. Valve actuator shall be
60 removable and be connected to 24V power to open and power to close control. Valve shall be
61 nickel plated forged brass up to 2.0" with internal EPMD O-ring and stainless steel ball and stem.

- 1 3. Automatic flow controls shall be manufactured by IMI Hydronic Engineering factory set to
2 automatically limit the flow within 5% of specified amount. Internal wear surfaces of the valve
3 cartridge are nickel and stainless steel with stainless steel spring.
- 4 4. Valves shall be provided by greenhouse manufacturer heating system supplier and installed by
5 greenhouse manufacturer heating system subcontractor.
- 6 5. Control wiring and conduit for the actuated valve shall be 24v-3 wire power open/power close to
7 environmental control system and shall be provided and installed electrical contractor.
- 8 F. In Slab PEX Manifold Mixing Group:
 - 9 1. Mixing Control: Floor heat flow shall be constant and provided by inline circulator per zone.
10 Designed flow rate shall be maintained per active zone using an automatic flow control and 24V
11 actuated three way modulating mixing valve. Control of the actuated valve shall be 24v-3 wire
12 floating point from environmental control system by the electrical contractor.
 - 13 2. BOD Control valves shall be manufactured by Belimo or approved equal. Valve actuator shall be
14 removable and be connected to 24V floating point control by electrical contractor. Valve shall be
15 nickel plated forged brass up to 2.0" with internal EPMD O-ring and stainless steel ball and stem.
16 BOD Automatic flow controls shall be manufactured by IMI Hydronic Engineering factory set to
17 automatically limit the flow within 5% of specified amount. Internal wear surfaces of the valve
18 cartridge are nickel and stainless steel with stainless steel spring.
 - 19 3. BOD Pumps: The pumps shall be centrifugal pumps
 - 20 a. Grundfos Inline, single stage, maintenance free wet rotor type with motor mounted directly
21 to the pump volute. Pump volute shall be constructed of cast iron and rated at 145PSI
22 working pressure. Impeller, impeller inlet cone, rotor can and rotor cladding shall be
23 constructed of stainless steel. Pump motors shall be rated for continuous duty operating on
24 115V, single phase, 60 Hertz alternating current.
 - 25 4. Valves and pumps shall be provided by greenhouse manufacturer heating system supplier and
26 installed by greenhouse manufacturer heating system subcontractor.
 - 27 5. Power & control wiring and conduit for the actuated valve shall be 24v-3 wire power open/power
28 close to environmental control system and shall be provided and installed electrical contractor.
- 29 G. Radiation shall supply total heat loss based on the design criteria using the following materials:
 - 30 1. BOD Radiation Fin Tube: Radiating materials shall be the Delta-T Fin SF125 aluminum finned pipe
31 installed around the perimeter low on the wall, upper perimeter and under the gutter snow melt,
32 using water temperatures up to 230F and will consist of the following components:
 - 33 a. 1.25" schedule 40 aluminum pipe with 3.25" x 3.25" x 0.025" aluminum fins at 48 fin/ft or 24
34 fins/ft based on design requirements. Pipe shall have each end grooved to accept the
35 grooved coupling provided.
 - 36 b. Coupling shall be grooved style with aluminum casting and high temperature gasket rated
37 for -60F to 230F. Coupling and external grooved fin system shall absorb expansion from
38 heated aluminum. Pressure ratings of 125 psi at 230F.
 - 39 c. Elbows shall be sch 40 cast aluminum with grooved connections.
 - 40 d. Expanded metal mesh fin tube covers to be provided over the Fin Tube heating system in
41 compartments with "low" perimeter fin position.
 - 42 e. All aluminum slide brackets shall be used on all fin tube when attached to side walls.
 - 43 f. Piping in the greenhouse compartments shall be schedule 40 steel or aluminum pipe and
44 shall be installed with grooved coupling technology. All piping that is exposed and will have
45 casual contact shall be insulated with 1.5 inch fiberglass insulation and be covered with
46 aluminum cover per drawing.
 - 47 g. All main piping in the corridors feeding the zones shall be schedule 40 steel piping using
48 grooved connections to all fittings.
 - 49 h. All piping shall be designed with expansion joints where required.
 - 50 2. Radiation Radiant heat: Radiating material shall be 5/8" Crosslinked Polyethylene tubing with
51 Oxygen barrier installed on 12 inch spacing at a minimum of 2 inches below the concrete surface
52 for greenhouse zones only.
 - 53 a. Tubing shall be attached to Wire mesh using wire ties every 2 feet.
 - 54 b. Water temperatures of 90°F to 130°F shall be pumped through the tubing at 20°F
55 temperature difference.
 - 56 c. Tubing shall be attached to a copper manifold using a crimp compression fitting.
 - 57 d. Each manifold shall be installed into a steel / galvanized box in the concrete slab and
58 covered with aluminum Diamond plate cover.
- 59 H. All straight piping shall be insulated with 1.5 inch fiberglass insulation and covered with aluminum jacket.
- 60 I. All piping shall be labeled with directional arrows and description.
- 61 J. All controls valves shall be tags with metal tags and chain.
- 62 K. All drain valves will be provided with caps attached with chain.

- 1 L. All necessary elbows, nipples, drain plugs, air bleeders, and expansion joints to complete the system
2 should be included in the system.
- 3 M. System control shall be by the greenhouse control system. This system shall control the zone actuators
4 based on air temperature inside each compartment and corridor.
- 5 N. Wells for the HWS & HWR sensors shall be provided and installed at zone valve stations and in the
6 greenhouse corridor and thermometers shall be provided and installed in the greenhouse zones as
7 indicated on the drawings. Temperature probe sensors shall be provided by Wadsworth and installation
8 shall be by the (low voltage) electrical contractor. Sensors shall be located in the corridor piping where this
9 system starts for only monitoring of the HWS & HWR temperatures. Thermometers shall be located in
10 each greenhouse zone at both the supply and return lines for visual monitoring only. Control wiring and
11 wiring connections by electrical contractor.
- 12 O. Engineering and Design for the heating system shall meet uniform mechanical code. All drawings shall be
13 blue lined drawings on standard D size, Stamped by mechanical engineer.
- 14 P. Installation: Full installation of the above system will be responsibility of the greenhouse contractor. The
15 installation shall be done with a crew experienced for not less than 5 years of installing hot water heating
16 systems.
- 17 Q. Installation shall include start up and testing of systems.

18 3.5 HIGH PRESSURE FOG SYSTEM

- 19 A. High pressure water atomization system for humidification shall include the following components:
 - 20 1. Fog nozzles
 - 21 2. Fog pump unit(s)
 - 22 3. Water treatment equipment.
 - 23 4. Fog nozzle manifolds and main feed lines.
 - 24 5. Electrical panels and automatic control valves.
- 25 B. The system component sizes and capacities shall meet the specified load for humidification.
- 26 C. General Requirements: The BOD humidification system for the greenhouse shall be a GoFog, Inc.
27 System.
- 28 D. The system is designed under the following conditions located as indicated per drawings:
- 29 E. High pressure atomizing system shall not use more than .003 kw/# of moisture generated.
- 30 F. Fog nozzle section:
 - 31 1. Nozzle: 316 stainless steel construction with a 0.008" (0.2 mm) machined orifice.
 - 32 2. Median droplet size to be between 10-40 microns with 95% of the droplets at 15 microns or less at
33 1,000 psig (69 bar) operating pressure.
 - 34 3. The nozzle manifold to be constructed of ½"OD 316 stainless steel tubing with 0.035" wall
35 thickness.
 - 36 4. Nozzle saddles to be TIG welded to the manifold.
 - 37 5. All connections between tubing to be 316 stainless steel double-ferrule compression fittings.
- 38 G. High pressure water pump units: Complete fog pump units shall include the following:
 - 39 1. Oil lubricated ceramic plunger pumps with stainless steel heads: Water lubricated axial piston
40 pumps are not to be used due to noise and vibration.
 - 41 2. Direct drive connection to the motor. Belt driven not to be used.
 - 42 3. Frame: Components to be mounted on a powder coated carbon steel frame.
 - 43 4. ABB VFD with pressure transducer to maintain pump pressure.
 - 44 5. Pump system shall be rack mounted and fully assembled at the factory. The factory mounted
45 equipment includes pumps, VFDs, filters, and associated control panels. Rack to be fully tested at
46 the factory prior to shipment.
 - 47 6. Pressure regulating valves: Stainless steel construction with stainless steel valve and valve seat.
 - 48 7. Electric motors shall be TEFC, premium efficiency model. Refer to Specification Section 16 15 0.
 - 49 8. Pump unit shall be capable of operating minimum zone without overheating of pump.
 - 50 9. Low water pressure cut-off: To protect pump in the event of low inlet pressure, manual reset with
51 signal to BMS.
 - 52 10. Low pressure discharge switch. To shut down the system if the pressure is not able to maintain
53 1,000 psi. Manual reset with signal to BMS.
 - 54 11. Low pressure gauge: liquid filled, for 0 to 100 psig.
 - 55 12. High pressure gauge: liquid filled, for 0 to 2,000 psi.
 - 56 13. Fitting and hoses: low-pressure side fittings shall be stainless steel construction. High-pressure
57 side fittings shall be of 304 stainless steel. Low-pressure inlet hoses and high-pressure discharge
58 hoses shall be provided as part of evaporative cooling system.
 - 59 14. All wetted parts including piping shall be non-corrosive (stainless steel). Provide all necessary
60 dielectric isolation.
- 61 H. Water treatment

- 1 1. Reverse osmosis water supply and connection shall be provided by plumbing contractor.
2 I. Zone control valves
3 1. High pressure motorized ball valves shall be provided on the water supply line to each zone to
4 modulate the output at the fog nozzles. The valves shall be rated for a minimum 1,000 psi
5 operating pressure with stainless steel wetted parts.
6 J. System control: Greenhouse control system will control the pump and zone actuators based on humidity
7 inside each compartment
8 K. Installation: Full installation of the above system will be responsibility of the greenhouse contractor and
9 shall include start up and testing of system.
- 10 **3.6 HORIZONTAL AIR FLOW FANS**
11 A. Air distribution system shall be 12" diameter horizontal air flow fans, BOD is VK12, as manufactured and
12 provided by Schaefer, Inc or pre-bid approved equal. Assembled unit to include totally enclosed fan cooled
13 motor (115V, 1/10 H.P., 1725 RPM), polyvinyl coated guard, aluminum 3 wind fan blade, 1342 CFM rating
14 and aluminum mounting bracket for hanging.
- 15 **3.7 RETRACTABLE SHADE/HEAT RETENTION CURTAIN SYSTEM**
16 A. General
17 1. Independently motorized BOD Shading and Heat Retention Curtain System designed for size as
18 shown on the drawings as manufactured by Rough Brothers Inc.
19 2. Curtains are to travel simultaneously from truss to truss and have a peaked or "roofline" profile with
20 a flat top.
21 3. Support lines with clear, low friction, polyester lines spaced 16" O.C.
22 4. Anti-billowing lines of clear polyester on 32" centers are to be used to contain curtain fabric.
23 5. System to include extruded aluminum seal angles at each truss location designed to accept rubber
24 seals for use in black-out systems and adjustable clips to secure support and anti-billowing lines to
25 the seal angle while maintaining straight lines down the length of the greenhouse.
26 6. BOD Shade fabric shall be TGU/Fiberlane Product Line:
27 a. FF/FR Trevira CS White 60% shade factor 50% energy savings
28 b. FF/FR Trevira CS Gray/White 60% shade factor 50% energy savings
29 B. Motors and Controls
30 1. System to be independently operated by one motor and controlled by the greenhouse control
31 system.
32 2. Motor is to be U.L. or CSA approved.
33 3. Primary and backup limit switches for each travel direction to be integrally mounted into the motor.
34 External limit switches are not acceptable.
35 C. Cable drive system
36 1. Drive cable to be a 3/32" diameter 7 x 19 stainless steel.
37 2. Drive cables are to be of a continuous length without any splices.
38 D. System hardware
39 1. All rotating components, i.e. bearing brackets and pulleys are to utilize pre-greased double sealed
40 ball bearings.
41 2. All hardware is to be corrosion protected by either galvanizing or plating
42 E. System sealing
43 1. Proper sealing of the curtain system at the trusses is to be accomplished using fixed fabric skirts as
44 energy seals.
45 2. Fixed fabric panels are to be wrapped and stapled around a 1x7 coated cable. Upper wrapped wire
46 of sidewall seal to be capped with a smooth plastic wire guard designed to reduce wear between
47 the above Shade/Heat retention Curtain and the Seal Fabric. Wire guard to travel the length of the
48 greenhouse.
49 3. All curtains to come precut with ends serged to prevent any unraveling of the material.
- 50 **3.8 HORIZONTAL RETRACTABLE BLACK OUT CURTAIN SYSTEM**
51 A. General
52 1. Independently motorized horizontal BOD Blackout and Heat Retention Curtain System designed for
53 size as shown on the drawings as manufactured by Rough Brothers Inc.
54 2. Curtains are to travel simultaneously from truss to truss and have a profile that will follow the
55 bottom chord of truss and be below the over shade system.
56 3. Support lines with clear, low friction, polyester lines spaced 16" O.C.
57 4. Anti-billowing lines of clear polyester on 32" centers are to be used to contain curtain fabric.

- 1 5. System to include extruded aluminum seal angles at each truss location designed to accept rubber
- 2 seals for use in black-out systems and adjustable clips to secure support and anti-billowing lines to
- 3 the seal angle while maintaining straight lines down the length of the greenhouse.
- 4 6. BOD Overhead blackout fabric shall be:
- 5 a. LS Svensson Obscura 10075 FR AB+BW 99% shade factor 75% energy savings
- 6 B. Motors and Controls
- 7 1. Overhead system to be independently operated by one motor and controlled by the greenhouse
- 8 control system.
- 9 2. Motor is to be U.L. or CSA approved.
- 10 3. Primary and backup limit switches for each travel direction to be integrally mounted into the motor.
- 11 External limit switches are not acceptable.
- 12 C. Cable drive system
- 13 1. Drive cable to be a 3/32" diameter 7 x 19 stainless steel.
- 14 2. Drive cables are to be of a continuous length without any splices.
- 15 D. System hardware
- 16 1. All rotating components, i.e. bearing brackets and pulleys are to utilize pre-greased double sealed
- 17 ball bearings.
- 18 2. All hardware is to be corrosion protected by either galvanizing or plating.
- 19 E. System sealing
- 20 1. Proper sealing of the curtain system at the trusses is to be accomplished using fixed fabric skirts as
- 21 energy seals.
- 22 2. Fixed fabric panels are to be wrapped and stapled around a 1x7 coated cable. Upper wrapped wire
- 23 of sidewall seal to be capped with a smooth plastic wire guard designed to reduce wear between
- 24 the above Shade/Heat retention Curtain and the Seal Fabric. Wire guard to travel the length of the
- 25 greenhouse.
- 26 3. All curtains to come pre-cut with ends serged to prevent any unraveling of the material.

27 3.9 VERTICAL ROLL-UP BLACKOUT CURTAIN SYSTEM

- 28 A. General
- 29 1. Independently motorized Vertical Roll Up Blackout Curtain Systems designed for size as shown on
- 30 the BOD drawings as manufactured by Rough Brothers Inc. or Wadsworth Control Systems.
- 31 2. Curtains are to travel from blackout perimeter seals at the bottom run of fin tube to blackout seal
- 32 angle, approximately 30" above finish floor or to the top of any piece of greenhouse equipment (ie
- 33 exhaust fans, evaporative pad system, etc...) or door.
- 34 3. Anti-billowing lines of clear polyester on 32" centers are to be used to contain curtain fabric.
- 35 4. BOD Rollup blackout fabric shall be:
- 36 a. Snyder Manufacturing WeatherSpan 500 13oz White, Flame Retardant 99% shade factor
- 37 5. Fixed fabric panels shall be used at the gable ends and along the sidewalls as indicated on the
- 38 drawings.
- 39 B. Motors and Controls
- 40 1. Each vertical wall to be independently operated by one tube motor and controlled by the
- 41 greenhouse control system.
- 42 2. Motor is to be U.L. or CSA approved.
- 43 a. Tube motor with limit switch for 22 revolutions
- 44 b. With aluminum tube 50 x 1.5 with coupling to a 50 mm rolling tube
- 45 c. Shaft journal 12x12mm with cotter pin for connection to guidance system
- 46 d. 4m length of UV resistant connection cable
- 47 3. Primary and backup limit switches for each travel direction to be integrally mounted into the motor.
- 48 External limit switches are not acceptable.
- 49 C. System hardware
- 50 1. All rotating components, i.e. bearing brackets and pulleys are to utilize pre-greased double sealed
- 51 ball bearings.
- 52 2. All hardware is to be corrosion protected by either galvanizing or plating.
- 53 D. System sealing
- 54 1. Proper sealing of the vertical roll up black out system is to be accomplished using fixed fabric skirts
- 55 as black out seals.
- 56 2. Fixed fabric corner panels are to be wrapped and stapled around a 1x7 coated cable. Wire of
- 57 corner seals to be capped with a smooth plastic wire guard designed to reduce wear.

58 3.10 NUTRIENT DELIVERY SYSTEM

- 59 A. BOD Nutrient Delivery System for irrigation shall include Dosatron 14 GPM (D45MZ2VFII) fertilizer injector
- 60 with filtration, regulator, mixing chamber and PH & EC monitor all in a kit-form as shown on drawings.

- 1 B. Nutrient Delivery System shall be installed in-line with irrigation system with a by-pass line with ball valves
- 2 for easy maintenance for manual operation only.
- 3 C. Dosing unit shall have the following:
- 4 1. Dilution range of 1:500 to 1:50
- 5 2. 0.4 to 14 GPM flow range
- 6 3. Operating pressure of 7-70 psi
- 7 4. 1" NPT connection
- 8 D. Nutrient Delivery System Start Kit shall include:
- 9 1. Filter
- 10 2. Pressure regulator
- 11 3. Hose fitting with ball valve
- 12 E. Nutrient Delivery System Monitor Kit shall include:
- 13 1. Mixing chamber
- 14 2. EC(ppm)/pH/ Temp Monitor with plug
- 15 3. Pressure gauge
- 16 4. Hose fitting with ball valve
- 17 F. Water Hammer Arrest Kit
- 18 G. System shall include a semi-clear 30 gallon tank with lid.
- 19 H. Owner shall provide solution for the system.
- 20 I. 115V outlet for the EC(ppm)/ph/ Temp Monitor shall be by the electrical contractor.
- 21 J. Plumbing contractor shall provide and install main water supply, backflow preventer and manual shut off
- 22 valve for Irrigation/ Fertigation System.
- 23 K. BOD Manufacturer: Dosatron, Inc.

24 3.11 LOW PRESSURE IRRIGATION SYSTEMS

- 25 A. Propagation benches shall be equipped with a bench top mounted misting system as shown on drawings.
- 26 Each individual bench system shall include a solenoid valve, cartridge filter and hand valve for individual
- 27 control.
- 28 B. The end of the system irrigation line shall be equipped with a manual shut off valve with hose bib fitting for
- 29 flush out.
- 30 C. Each system shall be controlled individually by the Greenhouse Control System.
- 31 D. Overhead misting units
- 32 1. Install 25mm aluminum PolyRail extrusion, supported by an aluminum riser system that is
- 33 equivalent to mist pattern coverage on bench, complete with connectors, hangers, riser stands,
- 34 polypipe and punch tool.
- 35 2. Aluminum 36" riser posts are to be mounted to the top of bench at 12' intervals with appropriate
- 36 aluminum base and cap with hook.
- 37 3. Flexible hose assemble will consist of 3/4" diameter X 6' long water supply hose with 3/4" fht swivel
- 38 couplings at each end. The flexible hose will connect the bench top polypipe to system piping and
- 39 will mount to the end of the bench with a 3/4" clamp.
- 40 4. This system shall be equipped with a 3/4" 24vac Professional series fast acting Solenoid valve, 3/4"
- 41 single union hand valve, 3/4" pressure regulator (35 psi), and PVC connectors and couplings. The
- 42 hand valve is to connect to the solenoid valve.
- 43 5. Nozzles will be alternating Blue and White JetRain with JETrain On/Off mini valves at 30" on center
- 44 and Grey JETRain 180 degree nozzles at each end.
- 45 6. Estimated flow rate per bench is 14 gpm.
- 46 E. Line voltage and low voltage wiring and conduit and final connections by Electrical Contractor.
- 47 F. BOD Manufacturer: DRAMM Corporation.

48 3.12 BENCH TOP HEATING SYSTEM

- 49 A. Bench top heating system shall be an EPDM system mounted to the top of the bench with high quality
- 50 EPDM rubber tubing and rigid plastic spacers and one-inch SCH 80 PVC pipe manifolds. Refer to
- 51 drawings for location of each system.
- 52 B. Hot water Supply temp: 135 F
- 53 C. Heat Source: Electric water heater and pump by mechanical contractor. All piping from unit to each bench
- 54 shall be by mechanical contractor. 1" MTHD stub outs with caps shall be provided at each bench by the
- 55 mechanical contractor.
- 56 D. Zone Control: System flow shall be constant. Designed flow rate shall be maintained per active zone
- 57 using an automatic flow control and 24V actuated three way zone control valve.
- 58 1. BOD Control valves shall be manufactured by Honeywell or approved equal. Valve actuator shall
- 59 be removable and be connected to 24V power to open and power to close control. Valve shall be
- 60 bronze up to 2.0" with internal EPMD O-rings, composite cartridge and stainless steel stem. BOD

- 1 Automatic flow controls shall be manufactured by IMI Hydronic Engineering factory set to
2 automatically limit the flow within 5% of specified amount. Internal wear surfaces of the valve
3 cartridge are nickel and stainless steel with stainless steel spring.
- 4 E. Valves shall be provided by greenhouse manufacturer heating system supplier and installed by
5 greenhouse manufacturer heating system subcontractor.
- 6 F. Control wiring and conduit for the actuated valve shall be 24v-3 wire power open/power close to
7 environmental control system and shall be provided and installed electrical contractor.
- 8 G. All necessary SCH 80 PVC fittings and piping from stub out to complete each bench system shall be
9 included.
- 10 H. System control shall be by the greenhouse control system. For each bench, zone actuators are controlled
11 based on soil temperature.
- 12 I. Wells for sensors at the zone valves shall be provided and installed by the bench heating supplier as
13 indicated on the drawings. Temperature probe sensors shall be provided by greenhouse control system
14 supplier and installation shall be by the electrical contractor. Control wiring and wiring connections by
15 electrical contractor.
- 16 J. Installation: Full installation of the above system will be responsibility of the greenhouse contractor.
- 17 K. Installation shall include start up and testing of systems.

18 **3.13 ENVIRONMENTAL CONTROL SYSTEM**

- 19 A. Provide environmental control interface panel as shown on drawings.
- 20 1. Complete low voltage operation (24 VAC)
- 21 2. The system shall be capable of controlling all the equipment in one zone.
- 22 3. The system shall provide data collecting, processing and storing for each greenhouse zone.
- 23 4. The system shall consider the greenhouse control parameters to determine the appropriate
24 operating conditions and the sequence of operation of the different greenhouse equipment and
25 systems to best maintain the desired set points.
- 26 5. The system shall allow for variable set points as a function of the control parameters.
- 27 6. User shall manually access control of set points and equipment settings for the greenhouse
28 equipment in each greenhouse zone via the control interface panel.
- 29 7. User shall be able to monitor the greenhouse zone environments directly from the control panel.
- 30 8. The system shall have the capacity to allow remote control for all set points, differentials and data
31 logging.
- 32 B. Switch/ router shall be provided by other for connection to the network.
- 33 C. Line voltage and low voltage wiring and conduit and final connections by Electrical Contractor.
- 34 D. Contactor Panel(s).
- 35 1. Low Voltage Control Panel
- 36 a. Allow for Auto/Off/On Switches for each output.
- 37 b. Contains sensor inputs, relay outputs & 0-10VDC signals.
- 38 2. Contactor Vent Panel
- 39 a. Provides the ability to control each vent or shade motor.
- 40 b. Provides contactors and thermal overloads required for each vent or curtain motor.
- 41 3. Contactor Light Panel
- 42 a. Provides the necessary contactors to operate the lights as specified in each zone.
- 43 4. All required load contactors, contact relays, and dry set of contacts for owner connected low/high
44 temperature alarm system.
- 45 5. Line voltage and low voltage wiring and conduit and connections by Electrical Contractor.
- 46 E. Control System shall be Seed by Wadsworth Control Systems.
- 47 F. Refer to Greenhouse Equipment Plan drawing for the list of equipment and systems to be controlled in the
48 greenhouse.
- 49 G. Sensors
- 50 1. Indoor temperature and relative humidity sensor for each zone, and one indoor temperature for the
51 corridor. Installation of the sensor, control wiring and wiring connections are by electrical contractor.
- 52 2. PAR light and light leveling sensors as indicated on drawings with control wiring. The sensors shall
53 be mounted below the shade fabric. Installation of the sensors, control wiring and wiring
54 connections are by electrical contractor.
- 55 3. Temperature probe sensors in stainless steel tubes as indicated on drawings.
- 56 a. For hot water temperature sensors, greenhouse heating supplier to provide saddle tees and
57 wells to receive each sensor as indicated on the drawings. These sensors are to monitor
58 the temperature of the hot water heating system. Electrical putty provided by the Electrical
59 Contractor is required to seal the sensor inside the well.
- 60 b. For benches with bench top heat as indicated on drawings, temperature probe soil sensors
61 shall be inserted into the soil and control the bench top heat.

- 1 c. Installation of the all temperature probe sensors, control wiring and wiring connections are
2 by electrical contractor.
- 3 4. Soil moisture probe sensor for the benches with misting systems. Installation of the sensor, control
4 wiring and wiring connections are by electrical contractor
- 5 H. Electrical contractor to mount all provided greenhouse environmental control system panels as shown on
6 drawings.
- 7 I. As indicated on the drawings, the existing control system (all control and contactor panels) for the
8 Conservatory will be removed. Refer to E-series drawings. These shall be replaced with the system
9 described above. Electrical Contractor shall be responsible for removal of the existing system, testing of
10 the existing wires and providing all wiring connections to the new system described above.
- 11 J. This system shall be connected via the network to the Conservatory Seed System for communication to
12 the system's weather station, alarm manager and Seed computer software.
- 13 K. Testing and Owner Training: Allow up to two consecutive days on-site for testing and owner training by
14 environmental controls manufacturer.

3.14 BENCHES

- 15 A. BOD Benches shall be "Ro-Flo Greenhouse Benches" as manufactured by Rough Brothers, Inc., or pre-
16 bid approved equal.
- 17 B. Bench height shall be 3'-0" from floor to expanded metal.
- 18 C. For sizes and quantities of benches, refer to the drawings.
- 19 D. Floating aisle benches
- 20 1. Support system shall be 14 ga.; 1.25" square galvanized steel tubing spaced at 6'-0" intervals.
- 21 2. Bench tops shall include 18 ga., 1" square galvanized steel tubing crosspieces spaced at 12"
22 intervals, extruded aluminum side and end rails with 4" perimeter edge and 3/4" hex #13 hot dip
23 galvanized expanded metal.
- 24 3. Cast aluminum corner connectors shall be used at end rails on all bench top corners. Exposed
25 metal corners are not acceptable.
- 26 4. Anti-tip devices with rollers shall be used to allow the bench top to roll and provide stability to the
27 bench top when it is in a rolled position. The anti-tip devices consist of plastic diablo wheel with
28 side guides bolted into an anti-tip clip which is screwed to the bench top crosspiece.
- 29 5. Two runs of 14 ga., 1.315 o.d. galvanized steel tubing shall be provided to support bench tops
30 above the support system. Two runs of 14 ga., 1.315" o.d. galvanized steel tubing shall be
31 installed 1'-2" above the floor to stabilize the support system).
- 32 6. Extruded aluminum fittings with galvanized bolts and stainless steel screws shall be used to
33 assemble the benches.
- 34 7. Bench support system for floating aisle benches shall be attached to concrete floor with wedge
35 anchor and.
- 36 E. Freestanding, stationary benches
- 37 1. Support system shall be 14 ga.; 1.25" square galvanized steel tubing spaced at 6'-0" intervals.
- 38 2. Bench tops shall include 18 ga., 1" square galvanized steel tubing crosspieces spaced at 12"
39 intervals, extruded aluminum side and end rails with 1" perimeter edge and 3/4" hex #13 hot dip
40 galvanized expanded metal.
- 41 3. Cast aluminum corner connectors shall be used at end rails on all bench top corners. Exposed
42 metal corners are not acceptable.
- 43 4. Two runs of 14 ga., 1.315 o.d. galvanized steel tubing shall be provided to support bench tops
44 above the support system.
- 45 5. Two runs of 14 ga., 1.315" o.d. galvanized steel tubing shall be installed 1'-2" above the floor to
46 stabilize the support system).
- 47 6. Extruded aluminum fittings with galvanized bolts and stainless steel screws shall be used to
48 assemble the benches.
- 49 7. Bench support system benches shall be attached to concrete floor with wedge anchor.
- 50

3.15 MESH PLANT WALLS

- 51 A. Metal mesh plant walls shall be galvanized steel with support framing mounted to the main structure. They
52 shall be 5' tall and be mounted above the kneewall.
53

3.16 HANGING PLANT RAILS SYSTEMS

- 54 A. Hanging plant rail system shall be provided where shown on the drawings.
- 55 1. Rail shall be 14 ga., 1.315 o.d. galvanized steel tubing.
- 56 B. Mounting methods, as shown on drawings:
- 57 1. An aluminum bracket shall be used when mounting to the gable columns.
58

- 1 2. Aluminum threaded rod shall be used to suspend the rail from a support member between the
- 2 partition wall and truss.

3 **PART 4 - DOORS AND HARDWARE**

4 **4.1 DOORS**

- 5 A. Single doors shall be 1 3/4" x 4'-0" x 7'-0" for interior and exterior, including sliding door.
- 6 B. Interior double doors shall be 1 3/4" x 8'-0" x 10'-0" each leaf active.
- 7 C. Exterior double doors shall be 1 3/4" x 8'-0" x 7'-0" with dummy trim and top and bottom concealed flush
- 8 bolts for inactive leaf.
- 9 D. Aluminum door construction:
 - 10 1. Clear anodized with 5" extruded tube rails and 4" extruded aluminum tube frame with wool pile
 - 11 seals.
 - 12 2. Upper panels shall be glazed with 1/4" clear safety glazing and lower panels shall be an aluminum
 - 13 faced panel.
 - 14 3. Horizontal rail shall be located at approx. hardware height and shall be the same for all doors. All
 - 15 rails and frame shall have a .125" minimum wall thickness.
 - 16 4. Seals and door sweeps

17 **4.2 HARDWARE**

- 18 A. Corridor interior door hardware shall include:
 - 19 1. Continuous hinge: Hager Roton 780-111 (120 degrees limit due to Magic Force)
 - 20 2. Surface closer: LCN 4040XP with Hold-Open Function
 - 21 3. Surface auto operator: Electro-hydraulic Stanley Magic-Force with push pads
 - 22 (Locate just below kneewall height) Installation of push pads,
 - 23 power, control wiring by electrical contractor.
 - 24 4. Interior door pull: Ives Straight Pull (1" DIA., 10" CTC) 8103-0
 - 25 5. Interior door push plate: Ives Push Plate 8303
 - 26 6. Kick plate: Ives 8400 10" 628 (4)/ leaf as shown on drawings
- 27 B. Sliding door hardware shall include:
 - 28 1. Interior Door Pull: Ives Rectangle Flush Pull with black inset 962
 - 29 (Both sides of the door)
 - 30 2. Hanger: Pemko 284
 - 31 3. Door Clip Stop: Pemko 287HD
 - 32 4. Door Guide: Pemko 106R/94
 - 33 5. Aluminum 280 door track: Pemko 200A/8 Henderson #280A96, 96"
 - 34 6. Facia: F134C
 - 35 7. End Plate: K134EO
 - 36 8. Aluminum Door Bottom Channel: Pemko 94A
 - 37 9. Kick plate: Ives 8400 10" 628 (4)/ leaf as shown on drawings
- 38 C. Exterior door hardware shall include:
 - 39 1. Single doors:
 - 40 a. Hinges: Standard Stainless Steel NRP 4 ½ X 4 ½ Butt Hinges
 - 41 b. Lock: Schlage Grade 1 Mortise L Series L9453 626
 - 42 (latch and deadbolt, key operated from outside, 6 pin cylinders)
 - 43 Lock cores with master keying by owner.
 - 44 c. Closer: LCN 4040XP with Hold-Open Function
 - 45 d. Kick Plate: Ives 8400 10" 628 (4)/ leaf as shown on drawings
 - 46 e. Threshold: Zero 540-series Saddle threshold ¼" H X 4" W X 48" L
 - 47 2. Double doors:
 - 48 a. Hinges: Standard Stainless Steel NRP 4 ½ X 4 ½ Butt Hinges
 - 49 b. Lock: Schlage Grade 1 Mortise L Series L9453 626
 - 50 (latch and deadbolt, key operated from outside, 6 pin cylinders)
 - 51 Lock cores with master keying by owner.
 - 52 c. Closer: LCN 4040XP with Hold-Open Function
 - 53 d. Kick Plate: Ives 8400 10" 628 (4)/ leaf as shown on drawings
 - 54 e. Threshold: Zero 540-series Saddle threshold ¼" H X 4" W X 96" L
 - 55 f. Flush Bolts: 12" Flush Bolts FB458-2 US26D for inactive leaf
 - 56 g. Astragal: Extruded aluminum for active leaf

1 **PART 5 - EXECUTION**

2 **5.1 INSTALLATION**

- 3 A. Drilling and setting of anchor bolts is to be by Greenhouse Manufacturer.
4 B. Install entire system and all components in strict accord with manufacture's recommendations.
5 C. Greenhouse Manufacturer is responsible for all unloading of greenhouse materials, systems, equipment
6 and to provide any lift or installation equipment required.
7 D. Environmental control system installation:
8 1. The greenhouse environmental controls supplier shall be responsible for supplying the greenhouse
9 environmental control panel(s), communication wire and sensor wire. The electrical contractor shall
10 be responsible for installing the control panel(s), communication wire and sensor wire and wiring
11 the sensors to the computerized control panels.
12 2. The electrical contractor shall be responsible for the final connections for the control and sensor
13 wiring in the computerized control panels.
14 E. The electrical contractor shall furnish and install all associated conduits, power wiring, control wiring from
15 the contactor panel to the control panel, and/or if a computer is provided, from computer to greenhouse
16 control panel, including any/all conduit for power wiring, sensor and communication wires, low voltage
17 control wiring, as required.
18 F. The electrical contractor will be responsible for the load wiring and load terminations in the contactor
19 panel, as well as limit switch wiring to the operable vent(s) and or shade/heat retention curtain system(s).

20 **5.2 DISSIMILAR MATERIALS**

- 21 A. Separate aluminum from cementitious material with polyurethane or asphaltic coating.

22 **5.3 GROUTING**

- 23 A. After the Greenhouse Manufacturer has placed the wall sills, the Masonry Contractor shall provide the
24 necessary materials and labor to grout between the wall and the sill to eliminate any discrepancies
25 between the two and produce a finished joint, if required.

26 **5.4 FLASHING**

- 27 A. All counter-flashing shall be furnished and placed by the sheet metal contractor. Drawings establishing
28 flashing line shall be furnished by the Greenhouse Manufacturer. All flashing and counter-flashing shall be
29 minimum 1/16" aluminum.

30 **5.5 INSTRUCTION**

- 31 A. Greenhouse Manufacturer's project manager shall be certified for having completed an OSHA
32 Construction Safety Training Course, ten (10) hour minimum. Greenhouse Manufacturer shall provide to
33 the jobsite one (1) complete "job-specific" Jobsite Safety Manual.
34 B. In addition to a minimum of (2) two site visits by Greenhouse Manufacturer project management,
35 Greenhouse Manufacturer personnel in combination with greenhouse environmental controls personnel
36 shall instruct owner, onsite, on the use and operation of the greenhouse, including greenhouse systems
37 and equipment. This training session shall be detailed so that the client understands how the greenhouse
38 and all of its systems operate.
39 C. Greenhouse Manufacturer shall supply the project with complete sets of Operation & Maintenance
40 manuals both in three ring binders (4) and via USB and/or share site. Maintenance manuals shall include
41 all equipment data and product literature including all periodic maintenance requirements.

42 **END OF SECTION**

SECTION 14 24 10

MRL HYDRAULIC TRACTION ELEVATORS

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PART 1 - **GENERAL**

1.1 SUMMARY

- A. Section includes: Hydraulic passenger elevators as shown and specified. Elevator work includes:
 - 1. Standard pre-engineered hydraulic passenger elevators.
 - 2. Elevator car enclosures, hoistway entrances and signal equipment.
 - 3. Jack(s).
 - 4. Operation and control systems.
 - 5. Accessibility provisions for physically disabled persons.
 - 6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
 - 7. Materials and accessories as required to complete the elevator installation.
- B. Related Sections:
 - 1. Division 1 General Requirements: Meet or exceed all referenced sustainability requirements.
 - 2. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
 - 3. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
 - 4. Division 5 Metals:
 - a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
 - b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
 - 5. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
 - 6. Division 22 Plumbing:
 - a. Sump pit and oil interceptor.
 - 7. Division 23: Heating and Ventilation:
 - a. Heating and ventilating hoistways.
 - 8. Division 16 Sections:

- 1 a. Providing electrical service to elevators. (note: fused disconnect switch to be provided as
- 2 part of elevator manufacture product, see section 2.11 Miscellaneous elevator components
- 3 for further details.)
- 4 b. Emergency power supply, transfer switch and auxiliary contacts.
- 5 c. Heat and smoke sensing devices.
- 6 d. Convenience outlets and illumination in hoistway and pit.
- 7 C. Work Not Included: General contractor shall provide the following in accordance with the requirements of
- 8 the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Section 300 for
- 9 hydraulic elevators. State or local requirements must be used if more stringent.
- 10 1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate
- 11 proper loads and clearances for elevator installation and operation.
- 12 2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets,
- 13 supports and bracing including all setting templates and diagrams for placement.
- 14 3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with
- 15 variations not to exceed 1/2" at any point.
- 16 4. Elevator hoistways shall have barricades, as required.
- 17 5. Install bevel guards at 75° on all recesses, projections or setbacks over 2" (4" for A17.1 2000
- 18 areas) except for loading or unloading.
- 19 6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide
- 20 divider beams between hoistway at each floor and roof.
- 21 7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from
- 22 rails and buffers.
- 23 D. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible
- 24 material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same
- 25 height, above sill of access door or handgrips.
- 26 1. All wire and conduit should run remote from the hoistways.
- 27 2. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet
- 28 terminals. Contacts on the sensors should be sided for 12 volt D.C.
- 29 3. Install and furnish finished flooring in elevator cab.
- 30 4. Finished floors and entrance walls are not to be constructed until after sills and door frames are in
- 31 place. Consult elevator contractor for rough opening size. The general contractor shall supply the
- 32 drywall framing so that the wall fire resistance rating is maintained, when drywall construction is
- 33 used.
- 34 5. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to
- 35 maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator
- 36 contractor.
- 37 6. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough
- 38 walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at
- 39 landings.
- 40 7. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and
- 41 properly grouted in place.
- 42 8. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance
- 43 with the elevator contractor's requirements.
- 44 9. General Contractor shall fill and grout around entrances, as required.
- 45 10. All walls and sill supports must be plumb where openings occur.
- 46 11. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the
- 47 access door.
- 48 12. Provide telephone line, light fixture (200 lx / 19 fc), and convenience outlet in the hoistway at the
- 49 landing where the elevator controller is located. Typically this will be at the landing above the first
- 50 floor. Final location must be coordinated with elevator contractor.
- 51 13. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway.
- 52 14. For signal systems and power operated door: provide ground and branch wiring circuits.
- 53 15. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.
- 54 16. Controller landing wall thickness must be a minimum of 8 inches thick. This is due to the controller
- 55 being mounted on the second floor landing in the door frame on the return side of the door. For
- 56 center opening doors, the controller is located on the right hand frame (from inside the elevator cab
- 57 looking out). These requirements must be coordinated between the general contractor and the
- 58 elevator contractor.
- 59 17. Cutting, patching and recesses to accommodate hall button boxes, signal fixtures, etc.
- 60

- 1 **1.2 SUBMITTALS**
- 2 A. Product data: When requested, the elevator contractor will provide standard cab, entrance and signal
- 3 fixture data to describe product for approval.
- 4 B. Shop drawings:
- 5 1. Show equipment arrangement in the pit and hoistway. Provide plans, elevations, sections and
- 6 details of assembly, erection, anchorage, and equipment location.
- 7 2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other
- 8 pertinent information.
- 9 3. Show floors served, travel distances, maximum loads imposed on the building structure at points of
- 10 support and all similar considerations of the elevator work.
- 11 4. Indicate electrical power requirements and branch circuit protection device recommendations.
- 12 C. Powder Coat Paint selection: Submit manufacturer's standard selection charts for exposed finishes and
- 13 materials.
- 14 D. Plastic laminate selection: Submit manufacturer's standard selection charts for exposed finishes and
- 15 materials.
- 16 E. Metal Finishes: Upon request, standard metal samples provided.
- 17 F. Operation and maintenance data. Include the following:
- 18 1. Owner's Manual and Wiring Diagrams.
- 19 2. Parts list, with recommended parts inventory.

- 20 **1.3 QUALITY ASSURANCE**
- 21 A. Manufacturer Qualifications: An approved manufacturer with minimum fifteen years experience in
- 22 manufacturing, installing, and servicing commercial elevators.
- 23 1. Shall be the manufacturer of the power unit, controller, signal fixtures, door operators cab,
- 24 entrances, and all other major parts of the elevator operating equipment.
- 25 a. The major parts of the elevator equipment shall be manufactured in the United States, and
- 26 not be an assembled system.
- 27 2. The manufacturer shall have a documented, on-going quality assurance program.
- 28 3. ISO-9001:2000 Manufacturer Certified.
- 29 4. ISO-14001:2004 Environmental Management System Certified.
- 30 5. LEED Gold certified elevator manufacturing facility.
- 31 B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than
- 32 fifteen years of satisfactory experience installing elevators equal in character and performance to the
- 33 project elevators.
- 34 C. Regulatory Requirements:
- 35 1. ASME/ANSI A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the
- 36 local building code.
- 37 2. Building Code: National.
- 38 3. NFPA 70 National Electrical Code.
- 39 4. NFPA 80 Fire Doors and Windows.
- 40 5. Americans with Disabilities Act Accessibility Guidelines (ADAAG).
- 41 6. CAN/CSA C22.1 Canadian Electrical Code.
- 42 7. CAN/CSA B44 Safety Code for Elevators and Escalators.
- 43 8. California Department of Public Health Standard Method V1.1-2010, CA Section 01350
- 44 D. Fire-rated Entrance Assemblies: Opening protective assemblies including frames, hardware, and
- 45 operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(B), and NFPA 80. Provide
- 46 entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing
- 47 Laboratory (2 hour label in Canada).
- 48 E. Inspection and testing: Elevator Installer shall obtain and pay for all required inspections, tests, permits
- 49 and fees for elevator installation.
- 50 1. Arrange for inspections and make required tests.
- 51 2. Deliver to the Owner upon completion and acceptance of elevator work.
- 52 F. Product Qualifications:
- 53 1. LCA, EPD and HPD data must be provided for all major components of the elevator system.
- 54 2. LCA data must be compatible with GaBI Software.
- 55 3. Environmental Product Declaration (EPD): Publicly available, critically reviewed life cycle analysis
- 56 having at least a cradle-to-gate scope.
- 57 4. GreenScreen Chemical Hazard Analysis: All ingredients of 100 parts-per-million or greater
- 58 evaluated using GreenScreen for Safer Chemicals Method v1.2.
- 59 5. Health Product Declarations (HPD v2 or later): Complete, published declaration with full disclosure
- 60 of known hazards, prepared using the Health Product Declaration Collaborative's "HPD builder" on-
- 61 line tool; Unknown hazard listed will not be considered acceptable.

1 **1.4 DELIVERY, STORAGE AND HANDLING**

2 A. Manufacturing will deliver elevator materials, components and equipment and the contractor is responsible
3 to provide secure and safe storage on job site.

4 **1.5 PROJECT CONDITIONS**

5 A. Prohibited Use: Elevators shall not be used for temporary service or for any other purpose during the
6 construction period before Substantial Completion and acceptance by the purchaser unless agreed upon
7 by Elevator Contractor and General Contractor with signed temporary agreement.

8 **1.6 WARRANTY**

9 A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace
10 defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or
11 care for 12 months after completion of installation or acceptance thereof by beneficial use, whichever is
12 earlier.

13 **1.7 MAINTENANCE**

14 A. Furnish maintenance and call back service for a period of 3 months for each elevator after completion of
15 installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours,
16 excluding callbacks. Service shall consist of periodic examination of the equipment, adjustment,
17 lubrication, cleaning, supplies and parts to keep the elevators in proper operation.
18 1. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of
19 the project site.

20 **PART 2 - PRODUCTS**

21 **2.1 ACCEPTABLE MANUFACTURERS**

22 A. Manufacturer: ThyssenKrupp Elevator:
23 1. Elevator Model: enduraMRL Above-Ground (1-stage).
24 B. Manufacturer: Otis Elevator Company:
25 1. Elevator Model: Otis Hydrofit.

26 **2.2 MATERIALS, GENERAL**

27 A. All Elevator Cab materials including frame, buttons, lighting, wall and ceiling assembly, laminates and
28 carpet shall have an EPD and an HPD, and shall meet the California Department of Public Health
29 Standard Method V1.1-2010, CA Section 01350 as mentioned in 1.03.9 of this specification.
30 B. Colors, patterns, and finishes: As selected by the Architect from manufacturer's standard colors, patterns,
31 and finish charts.
32 C. Stainless Steel: 304 alloy, satin finish.
33 D. Steel:
34 1. Shapes and bars: Carbon.
35 2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
36 3. Finish: Factory-applied baked enamel for structural parts, powder coat for architectural parts.
37 Color selection shall be based on elevator manufacture's standard selections.
38

1 **2.3 HOISTWAY EQUIPMENT**

- 2 A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood
3 subfloor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated
4 to support one-piece loads weighing up to 25% of the rated capacity.
- 5 B. Sling: Steel stiles affixed to a steel crosshead and bolstered with bracing members to remove strain from
6 the car enclosure.
- 7 C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.
- 8 1. Guide Shoes: Slide guides shall be mounted on top and bottom of the car.
- 9 2. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on a steel template that is
10 fastened to the pit floor. Provide extensions if required by project conditions.
- 11 3. Jack: Jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack
12 to insure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is
13 prohibited in the jack construction. Provide the following jack type: Twin post holeless. Two jacks
14 piped together, mounted one on each side of the car with a polished steel hydraulic plunger housed
15 in a sealed steel casing having sufficient clearance space to allow for alignment during installation.
16 Each plunger shall have a high pressure sealing system which will not allow for seal movement or
17 displacement during the course of operation. Each Jack Assembly shall have a check valve built
18 into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack
19 to its fully contracted position. The jack shall be designed to be mounted on the pit floor or in a
20 recess in the pit floor. Each jack section shall have a bleeder valve to discharge any air trapped in
21 the section.
- 22 4. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically
23 bring the car to the landings and correct for overtravel or undertravel. Self-leveling shall, within its
24 zone, be automatic and independent of the operating device. The car shall be maintained
25 approximately level with the landing irrespective of its load.
- 26 5. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National
27 Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the
28 power unit to the jack unit. Provide proper grade readily biodegradable oil as specified by the
29 manufacturer of the power unit (see Power Unit section 2.04.G for further details).
- 30 6. Pit moisture/water sensor located approximately 1 foot above the pit floor to be provided. Once
31 activated, elevator will perform "flooded pit operation", which will run the car up to the designated
32 floor, cycle the doors and shut down and trip the circuit breaker shunt to remove 3 phase power
33 from all equipment, including pit equipment.
- 34 7. Motorized oil line shut-off valve shall be provided that can be remotely operated from the controller
35 landing service panel. Also a means for manual operation at the valve in the pit is required.

36 **2.4 POWER UNIT**

- 37 A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator pit
38 consisting of the following items:
- 39 1. NEMA 4/Sealed Oil reservoir with tank cover including vapor removing tank breather
- 40 2. An oil hydraulic pump.
- 41 3. An electric motor.
- 42 4. Electronic oil control valve with the following components built into single housing; high pressure
43 relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and
44 electro-magnetic controlling solenoids.
- 45 B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service.
46 Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation.
47 Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.
- 48 C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating –
49 motors shall be capable of 80 starts per hour with a 30% motor run time during each start.
- 50 D. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with
51 separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be
52 made without removing the assembly from the oil line.
- 53 1. Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing
54 back pressure more than 10 percent above that required to barely open the valve.
- 55 2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of
56 motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit,
57 ensuring smooth up starts and up stops.
- 58 3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
- 59 4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed,
60 leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve

- 1 shall be designed to level the car to the floor in the direction the car is traveling after slowdown is
2 initiated.
- 3 5. Provided with constant speed regulation in both up and down direction. Feature to compensate for
4 load changes, oil temperature, and viscosity changes.
- 5 6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
- 6 7. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is
7 required to be able to raise (reposition) the elevator in the event of a system component failure (i.e.
8 pump motor, starter, etc.)
- 9 8. Oil Type: Readily biodegradable that is USDA certified biobased product, ultra low toxicity, readily
10 biodegradable, energy efficient, high performing fluid made from canola oil with antioxidant,
11 anticorrosive, antifoaming, and metal-passivating additives. Especially formulated for operating in
12 environmentally sensitive areas. USDA certified biobased product, 95% bio-based content, per
13 ASTM D6866.

14 2.5 HOISTWAY ENTRANCES

- 15 A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening
16 bolted\knock down construction.
- 17 1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger
18 covers, fascia plates, sight guards, and necessary hardware.
- 19 2. Main landing door & frame finish: ASTM A1008 steel panels, factory applied powder coat finish.
- 20 3. Typical door & frame finish: ASTM A 366 steel panels, factory applied powder coat enamel finish.
- 21 B. Integrated Control System: the elevator controller to be mounted to hoistway entrance above first landing.
22 The entrance at this level, shall be designed to accommodate the control system and provide a means of
23 access to critical electrical components and troubleshooting features. See section 2.09 Control System for
24 additional requirements.
- 25 C. At the controller landing, the hoistway entrance frame shall have space to accommodate and provide a
26 lockable means of access (group 2 security) to a 3 phase circuit breaker. See section Miscellaneous
27 Elevator Components for further details.
- 28 D. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code.
29 Provide door restriction devices as required by code.
- 30 E. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each
31 hoistway horizontal sliding door.
- 32 1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
- 33 2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during
34 operation.
- 35 3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.
- 36 F. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

37 2.6 CAR ENCLOSURE

- 38 A. Car Enclosure:
- 39 1. Walls: Cab type TKAP, reinforced cold-rolled steel with two coats factory applied baked enamel
40 finish.
- 41 2. Canopy: Cold-rolled steel with hinged exit.
- 42 3. Ceiling: Suspended type, LED Perimeter-Lit, Painted White.
- 43 4. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with plastic laminate.
- 44 5. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave
45 type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom
46 by non-metallic sliding guides.
- 47 a. Door Finish: Satin Stainless Steel.
- 48 b. Cab Sills: Extruded aluminum, mill finish.
- 49 6. Handrail: Provide 2 inches flat metal bar on side and rear walls. Handrails shall have a stainless
50 steel, no. 4 brushed finish.
- 51 7. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.
- 52 B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency
53 stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal
54 operating devices inoperative. The station will give the inspector complete control of the elevator. The car
55 top inspection station shall be mounted in the door operator assembly.
56

1 **2.7 DOOR OPERATION**

- 2 A. Door Operation: Provide a direct current motor driven heavy duty operator designed to operate the car
3 and hoistway doors simultaneously. Door movements shall be electrically cushioned at both limits of travel
4 and the door operating mechanism shall be arranged for manual operation in event of power failure.
5 Doors shall automatically open when the car arrives at the landing and automatically close after an
6 adjustable time interval or when the car is dispatched to another landing. Closed-loop, microprocessor
7 controlled motor-driven linear door operator, with adjustable torque limits, also acceptable. AC controlled
8 units with oil checks or other deviations are not acceptable.
- 9 1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or
10 hall call, answering a car or hall call at the present position or selected as a dispatch car.
 - 11 2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no
12 coincident hall call), the current door hold open time is changed to a shorter field programmable
13 time when the electronic door protection device is activated.
 - 14 3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no
15 car calls, and no other hall call assignments, the car door opens to answer the hall call in the
16 direction of the car's current travel. If an onward car call is not registered before the door closes to
17 within 6 inches of fully closed, the travel will reverse and the door will reopen to answer the other
18 call.
 - 19 4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the
20 presence of a passenger or object in the door opening. If door closing is prevented for a field
21 programmable time, a buzzer will sound. When the obstruction is removed, the door will begin to
22 close at reduced speed. If the infra-red door protection system detects a person or object while
23 closing on nudging, the doors will stop and resume closing only after the obstruction has been
24 removed.
 - 25 5. Limited Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors
26 will reverse and reopen partially. After the obstruction is cleared, the doors will begin to close.
 - 27 6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time,
28 the doors will recycle closed then attempt to open six times to try and correct the fault.
 - 29 7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time,
30 the doors will recycle open then attempt to close six times to try and correct the fault.
 - 31 8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door
32 drive motor shall have increased torque applied to possibly overcome mechanical resistance or
33 differential air pressure and allow the door to close.
- 34 B. Door Protection Devices: Provide a door protection system using 150 or more microprocessor controlled
35 infra-red light beams. The beams shall project across the car opening detecting the presence of a
36 passenger or object. If door movement is obstructed, the doors shall immediately reopen.

37 **2.8 CAR OPERATING STATION**

- 38 A. Car Operating Station, General: The main car control in each car shall contain the devices required for
39 specific operation mounted in an integral swing return panel requiring no applied faceplate. Swing return
40 shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return
41 and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED's shall be
42 included for each floor served, and emergency buttons and switches shall be provided per code. Switches
43 for car light and accessories shall be provided.
- 44 B. Emergency Communications System: Integral phone system provided.
- 45 C. Auxiliary Operating Panel: Not Required
- 46 D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located
47 in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern
48 will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall
49 remain illuminated until the door(s) begin to close.

50 **2.9 CONTROL SYSTEMS**

- 51 A. Controller: Shall be integrated in a hoistway entrance jamb. Should be microprocessor based, software
52 oriented and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure.
53 Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to
54 correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate
55 landing and "call" push buttons at terminal landings.
- 56 B. Service Panel – to be located outside the hoistway in the controller entrance jamb and shall provide the
57 following functionality/features:
- 58 1. Access to main control board and CPU
 - 59 2. Main controller diagnostics
 - 60 3. Main controller fuses

- 1 4. Universal Interface Tool (UIT)
- 2 5. Remote valve adjustment
- 3 6. Electronic motor starter adjustment and diagnostics
- 4 7. Operation of pit motorized shut-off valve with LED feedback to the state of the valve in the pit
- 5 8. Operation of auxiliary pump/motor (secondary hydraulic power source)
- 6 9. Operation of electrical assisted manual lowering
- 7 10. Provide male plug to supply 110VAC into the controller
- 8 11. Run/Stop button
- 9 C. Automatic Light and Fan shut down: The control system shall evaluate the system activity and
- 10 automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be
- 11 field programmable.
- 12 D. Special Operation: Not Applicable
- 13 E. Emergency Power Operation: (Battery Lowering 10-DOC) When the loss of normal power is detected, a
- 14 battery lowering feature is to be activated. The elevator will lower to a predetermined level and open the
- 15 doors. After passengers have exited the car, the doors will close and the car will shut down. When normal
- 16 power becomes available, the elevator will automatically resume operation. The battery lowering feature is
- 17 included in the elevator contract and does not utilize a building-supplied standby power source.

18 2.10 HALL STATIONS

- 19 A. Hall Stations, General: Vandal resistant buttons with halo effect which illuminate to indicate that a call has
- 20 been registered at that floor for the indicated direction. Each button shall be provided with an internal
- 21 automatic stop to prevent damage of switches that register the call. Provide 1 set of pushbutton risers. All
- 22 fixtures shall be vandal resistant type.
- 23 1. Provide one pushbutton riser with faceplates having a satin stainless steel finish.
- 24 2. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station
- 25 at the designated level.
- 26 B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans
- 27 with Disabilities Act (ADA) requirements.
- 28 C. Hall Position Indicator: Not Applicable
- 29 D. Hall lanterns: Not Applicable
- 30 E. Special Equipment: Not Applicable

31 2.11 MISCELLANEOUS ELEVATOR COMPONENTS

- 32 A. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location.
- 33 The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.
- 34 B. Lockable three phase circuit breaker with auxiliary contact with shunt trip capability to be provided. Circuit
- 35 breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb
- 36 and should be sized according to the National Electrical Code.
- 37 C. Lockable single phase 110V circuit breaker for cab light and fan to be provided. Circuit breaker to be
- 38 located behind locked panel (Group 2 security access) at controller landing entrance jamb should be sized
- 39 according to the National Electrical Code.

40 PART 3 - EXECUTION

41 3.1 EXAMINATION

- 42 A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and control space, as
- 43 constructed and verify all critical dimensions, and examine supporting structures and all other conditions
- 44 under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory
- 45 conditions have been corrected in a manner acceptable to the installer.
- 46 B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

47 3.2 INSTALLATION

- 48 A. Install elevator systems components and coordinate installation of hoistway wall construction.
- 49 1. Work shall be performed by competent elevator installation personnel in accordance with ASME
- 50 A17.1, manufacturer's installation instructions and approved shop drawings.
- 51 2. Comply with the National Electrical Code for electrical work required during installation.
- 52 B. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to
- 53 avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure
- 54 dimensional coordination of the work.

- 1 C. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for
2 accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until
3 car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.
4 D. Lubricate operating parts of system where recommended by manufacturer.
- 5 **3.3 FIELD QUALITY CONTROL**
6 A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator,
7 perform acceptance tests as required by A17.1 Code and local authorities having jurisdiction. Perform
8 other tests, if any, as required by governing regulations or agencies.
9 B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to
10 be performed on the elevator.
- 11 **3.4 ADJUSTING**
12 A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly
13 and accurately.
- 14 **3.5 CLEANING**
15 A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in
16 accordance with manufacturer's recommendations for type of material and finish provided. Stainless stall
17 shall be cleaned with soap and water and dried with a non-abrasive surface; shall not be cleaned with
18 bleached-based cleansers.
19 B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean
20 equipment rooms and hoistway. Remove trash and debris.
21 1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners
22 that contain solvents, pine and/or citrus oils are not permitted.
- 23 **3.6 PROTECTION**
24 A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective
25 coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from
26 damage or deterioration. Maintain protective measures throughout remainder of construction period.
- 27 **3.7 DEMONSTRATION**
28 A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review
29 emergency provisions, including emergency access and procedures to be followed at time of failure in
30 operation and other building emergencies. Train Owner's personnel in normal procedures to be followed
31 in checking for sources of operational failures or malfunctions.
32 B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of
33 substantial completion. Determine that control systems and operating devices are functioning properly.
- 34 **3.8 ELEVATOR SCHEDULE**
35 A. Elevator Qty. 1.
36 1. Rated Capacity: 3000 lbs.
37 2. Rated Speed: 100 ft./min.
38 3. Operation System: TAC32
39 4. Travel: Refer to Drawings.
40 5. Landings: 2 total.
41 6. Openings:
42 a. Front: 1.
43 b. Rear: 0.
44 7. Clear Car Inside: Refer to drawings.
45 8. Cab Height: 8'-0" nominal.
46 9. Hoistway Entrance Size: 4'-0" wide x 7'-0" high.
47 10. Door Type: Single Speed.
48 11. Opening: Front, Right Hand.
49 12. Power Characteristics: 460 volts, 3 Phase, 60 Hz.
50 13. Seismic Requirements: Zone 1.
51 14. Fixture & Button Style: Vandal Resistant Signal Fixtures.
52 15. Special Operations: None.
53 16. Cab Entrance: Satin Stainless Steel.
54 17. Operating Panel: Satin Stainless Steel.
55 18. Car Panels: Custom Laminate, PLAM-4.

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- 1 19. Handrail: Flat Bar 2 inches W, Satin Stainless Steel.
- 2 20. Bumper Rail: Solid Bar, Satin Stainless Steel.
- 3 21. Ceiling: LED Perimeter-Lit, Painted White.
- 4 22. Flooring: Custom, See Finish Plan.
- 5 23. Hall Entrance: Charcoal EW-4.
- 6 24. Fixtures: Classic, Satin Stainless Steel.
- 7 25. Buttons: Flush, Illuminated Halo.
- 8

END OF SECTION