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PROJECT MANUAL

ESCAMBIA COUNTY SUPERVISOR OF ELECTIONS

WAREHOUSE RENOVATION

3201 West Navy Boulevard

Pensacola, Florida

32505

BID SET

JANUARY 11, 2019



Set No. _____

Limited Indoor Mold Assessment Report-Designated Areas

Supervisor of Elections Warehouse
3201 West Navy Boulevard
Pensacola, Florida

October 18, 2018
Terracon Project No. EA187092



Prepared for:
Design and Construction Administration-
Escambia County Facilities Management
Pensacola, Florida

Prepared by:
Terracon Consultants, Inc.
Pensacola, Florida

Offices Nationwide
Employee-Owned

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terracon.com

Terracon

Geotechnical ■ Environmental ■ Construction Materials ■ Facilities



October 18, 2018

Design and Construction Administration-Escambia County Facilities Management
100 E Blount Street
Pensacola, Florida 32501

Attn: Mr. George Bush, Division Manager
P: (850) 595-3190
E: gcbush@myescambiacounty.com

Re: Limited Mold Assessment Report-Designated Areas
Supervisor of Elections Warehouse
3201 West Navy Boulevard
Pensacola, Florida
Terracon Project No. EA187092

Dear Mr. Bush:

This report presents the findings of our Limited Mold Assessment performed by Terracon on October 11, 2018 at the above-referenced location. Our services were performed in general accordance with Terracon Proposal Number PEA187092 dated October 2, 2018.

We appreciate the opportunity to provide this service to Design and Construction Administration-Escambia County Facilities Management. If you have any questions regarding this report, please contact our office at 850-477-0454.

Sincerely,

Terracon

Michael R. Cobb
Project Industrial Hygienist

Russell E. Stauffer, PE
Licensed Mold Assessor MRSA #2010
Authorized Project Reviewer

Terracon Consultants, Inc. 9900 North Davis Highway, Pensacola, Florida 32514
P [850] 477-0454 F [850] 477-0534 terracon.com

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LIMITED MOLD ASSESSMENT REPORT-DESIGNATED AREAS

**Supervisor of Elections Warehouse
3201 West Navy Boulevard
Pensacola, Florida
Terracon Project No. EA187092**

1.0 PROJECT DESCRIPTION

Terracon Consultants, Inc. (Terracon) conducted a Limited Mold Assessment within the designated areas of the Supervisor of Elections (SOE) Warehouse located at 3201 West Navy Boulevard in Pensacola, Florida. The designated areas consisted of ceilings systems associated with the front and rear mezzanines and sales floor. The assessment activities were conducted on October 11, 2018 by Terracon representative Michael R. Cobb working under the direction of Mr. Russell E. Stauffer (Florida Licensed Mold Assessor) as required per F.S. 468.84-8424, mold related services.

It is our understanding, that during renovation designs suspect mold growth was encountered on ceiling insulation. Terracon was contracted to perform a limited mold assessment to include observations and limited surface sampling associated with the designated areas.

1.1 Scope of Services

The objective of Terracon's services was to perform a visual assessment of suspect microbial growth and collection of bulk surface samples within designated areas to assess the presence of mold. It should also be noted, that the SOE was not occupied at the time of Terracon's site visit.

1.2 Standard of Care

This assessment was conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the same locale. The results, findings, conclusions, and recommendations expressed in this report are based on conditions observed during our assessment. Many factors, such as weather conditions, building occupancy, ventilation patterns, and seasonal variations in fungal/bacterial concentrations or local sources of volatile chemicals, can affect the conditions observed. The information contained in this report should not be relied upon to represent conditions that existed prior to or after this assessment. Terracon does not warrant the services of regulatory agencies, laboratories, or other third parties supplying information that may have been used in the preparation of this report.

1.3 Reliance

The report has been prepared on behalf of and exclusively for use by Design and Construction Administration-Escambia County Facilities Management (Client) for specific application to their project as discussed. No other individual or entity may rely on this report without written permission of Terracon and Client. Reliance on this report by Client and all authorized parties will be subject to the key understandings and limitations stated in the proposal, this report, and Terracon's Agreement with Client. The limitation of liability defined in Terracon's Agreement is the aggregate limit of Terracon's liability to Client and all relying parties.

2.0 ASSESSMENT CRITERIA AND METHODS

2.1 Visual Observations

The objective of the visual observations was to identify the presence of visible fungal growth within the designated areas of the SOE Warehouse. The physical observations can help to formulate plans for more in-depth assessment.

The visual observations included:

- The identification of any discoloration or odor that could indicate moisture intrusion, water damage, and/or fungal growth;
- Ceilings; and
- Observation of readily accessible components of the HVAC systems.

The physical assessment was conducted in general accordance with guidelines published by the American Industrial Hygiene Association (AIHA) in *Recognition, Evaluation, and Control of Indoor Mold*, 2008; *Assessment, Remediation, and Post-Remediation Verification of Mold in Buildings* (AIHA Guideline 3-2004); and the U.S. Environmental Protection Agency (EPA), *Mold Remediation in Schools and Commercial Buildings*, 2008.

Destructive sampling or testing to inspect interior wall cavity spaces or mechanical enclosures was not within the scope of work for this project. Terracon did not attempt to identify any sources of moisture intrusion. A summary of general building information and results of the physical assessment observation are contained in Table 3.1.

2.2 Mold Sampling

There are no State or Federal exposure limits established for fungal aerosols. There are currently no regulatory standards or medically based threshold limit or dose-response relationships for exposure to airborne or surface concentrations of mold spores. Terracon relies upon experience, professional judgment, current scientific literature, guidelines and recommendations made by professional organizations and experts, and statistical methods in interpreting mold sampling results.

Bulk samples were collected from select surfaces using laboratory supplied tape lift sample collectors following laboratory supplied instructions. After bulk sample collection, the tape lifts were delivered under chain-of-custody (COC) protocol to EMLab P&K Laboratories, Inc. (EMLab P&K) in Phoenix, Arizona. EMLab P&K is accredited by the American Industrial Hygiene Association (AIHA®) Laboratory Accreditation Programs, LLC under the Environmental Microbiology Laboratory Accreditation Program (EMLAP Accreditation Number 102297). The results for surface bulk samples are reported total spore fungal concentrations per square centimeter (cm²). The laboratory analytical report is included in Appendix A

3.0 FINDINGS

This section includes the findings and a discussion of our physical assessment and fungal sampling results. The site drawing is located in Appendix B and depicts locations of relevant findings and sample locations. Appendix C includes photos of notable features and/or findings associated with this assessment.

3.1 Visual Observations

Table 3.1 contains an overview of findings from the visual observations. Significant findings are discussed in the section that follows.

Table 3.1
Physical Assessment Findings

Inspection Parameter	Observation Comments
Year Constructed	1986
Type of Occupancy	Currently Vacant
Major Renovations	None Reported
Floors Above/Below Grade	Two story approximately 16,780 square feet ⁽¹⁾
Physical Examination (odors, housekeeping)	The building is not currently occupied. No notable housekeeping procedures were in effect. Previously the power had been shut off to the building during the property transaction phase.
Structure Description	Slab-on-grade, metal modular building with a front and rear mezzanine. The front mezzanine was historically utilized as office space with restrooms. The rear mezzanine appeared to be utilized as storage.
Types of Interior Finishes	<ul style="list-style-type: none"> ■ Painted gypsum, wood paneling and CMU walls ■ Drop down ceiling grid systems ■ Carpeting, vinyl floor tiles, and sheet flooring
Discoloration/Water Staining	Suspect roof leak within Office 201. Areas of suspect microbial growth (SMG) noted throughout designated areas except Rooms 209, 212, and 213 (Photos 1-4). Standing water was observed on the wooden flooring within Office 201.

Inspection Parameter	Observation Comments
HVAC System	HVAC systems and associated duct work that supplied heating and cooling to the sales floor and front mezzanine are scheduled to be demolished ⁽²⁾ . The rear mezzanine is not heated or cooled by an HVAC system(s).

Notes

(1) Information obtained from the Escambia County Property Appraiser's website.

(2) Information was obtained during an onsite meeting between Escambia County representative George Bush and Terracon representative Michael Cobb.

3.2 Surface Bulk Sampling

Terracon collected eight bulk samples using tape-lifts from surfaces suspected to contain microbial growth. The surface bulk samples were collected using laboratory-supplied tape-lifts pressed over the suspect microbial growth area. The purpose of a direct microscopic examination of a sample taken from a surface is to document whether or not mold is on the surface sampled, and if so, what kinds of molds are present. This type of analysis may identify marker genera that may be indicative of indoor mold being present. The presence of biological materials on a particular surface is not a direct indication of what may be in the air. The analytical results are presented in Table 3.2.

Table 3.2
Surface Bulk Sample Results

Sample No.	T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8
Sample Location	Vinyl-Backed Fiberglass Insulation Room 201	Vinyl-Backed Fiberglass Insulation Room 207	Vinyl-Backed Fiberglass Insulation Room 209	Vinyl-Backed Fiberglass Insulation Room 213	Vinyl-Backed Fiberglass Insulation Room 212	Fiberglass Batt Insulation with Kraft Paper Balcony	Metal Crown Flashing Rear Mezzanine	Vinyl-Backed Fiberglass Insulation Rear Mezzanine
Spore Types	Count/cm ²	Count/cm ²	Count/cm ²	Count/cm ²	Count/cm ²	Count/cm ²	Count/cm ²	Count/cm ²
<i>Ascospores</i>	--	--	--	--	--	130	--	--
<i>Basidiospores</i>	--	--	--	--	2	200	--	--
<i>Cladosporium</i>	110,000	100,000	--	--	--	8,800	130,000	120,000
<i>Aspergillus/ Penicillium</i>	--	--	--	--	--	50	--	--
TOTAL FUNGI	110,000	100,000	--	--	2	9,100	130,000	120,000
<i>Background Debris**</i>	1+	2+	2+	2+	2+	3+	2+	1+

Laboratory results indicate an elevated presence of mold in five of the eight samples collected. The levels of mold identified in samples T-1, T-2, and T-6 through T-8 are considered elevated above typical background levels (<1,000 counts/cm²). The laboratory analytical report is included in Appendix A. The sample locations are depicted in the drawing presented in Appendix B.

4.0 CONCLUSIONS

Terracon performed a limited mold assessment within the designated areas of the SOE Warehouse in Pensacola, Florida. The assessment consisted of a visual assessment, and the collection of tape lift bulk samples. The following is a summary of results associated with the assessment:

- Standing water was observed within Room 201 more than likely attributed to a roof leak.
- Suspect microbial growth was located on vinyl-faced fiberglass insulation and batt insulation with kraft paper throughout the designated areas with the exception of Rooms 209, 212, and 213.
- Five out of the eight tape lift bulk samples (T-1, T-2, and T6-T8) collected indicated elevated surface mold within the majority of the designated areas. The remaining three tape lift bulk samples (T3-T5) did not indicated the presence of mold within Rooms 209, 212, and 213.

5.0 RECOMMENDATIONS

Based on the findings of the assessment Terracon recommends the following activities:

- Repair suspect roof leaks and replace or repair water damaged building materials.
- Remove ceiling grid systems, vinyl-faced fiberglass insulation, and batt insulation with kraft paper with the presence of mold in areas noted on the drawing in Appendix B. Cleaning and remediation of materials with mold would need to be done in accordance with F.S. 468.84-8424.
- Clean impervious surfaces with identified surface mold, i.e. metal crown flashing with a microbial disinfectant. Cleaning and remediation of materials with mold would need to be done in accordance with F.S. 468.84-8424.

- Have a HVAC contractor evaluate and possibly consider the creation of a conditioned air environment to minimize future potential humidity and condensation issues associated with the rear mezzanine.

APPENDIX A

Laboratory Data



Report for:

Mr. Michael Cobb
Terracon - Pensacola
9900 North Davis Highway
Pensacola, FL 32514

Regarding: Project: EA187092; SOE Warehouse
EML ID: 2021522

Approved by:

Operations Manager
Joshua Cox

Dates of Analysis:

Quantitative spore count direct exam: 10-15-2018

Service SOPs: Quantitative spore count direct exam (EM-MY-S-1041)
AIHA-LAP, LLC accredited service, Lab ID #102297

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. Due to the nature of the analyses performed, field blank correction of results is not applied. The results relate only to the items tested.

EMLab P&K ("the Company") shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.

EMLab P&K's LabServe® reporting system includes automated fail-safes to ensure that all AIHA-LAP, LLC quality requirements are met and notifications are added to reports when any quality steps remain pending.

Client: Terracon - Pensacola
C/O: Mr. Michael Cobb
Re: EA187092; SOE Warehouse

Date of Sampling: 10-11-2018
Date of Receipt: 10-12-2018
Date of Report: 10-15-2018

QUANTITATIVE SPORE COUNT REPORT

Location:	TB: Blank		T-1: Vinyl-Backed Fiber Ins. 201		T-2: Vinyl-Backed Fiber Ins. 207	
Comments (see below)	A		None		None	
Sample type	Tape sample		Tape sample		Tape sample	
Lab ID-Version‡:	9537897-1		9537898-1		9537899-1	
Analysis Date:	10/15/2018		10/15/2018		10/15/2018	
	raw ct.	spores/unit	raw ct.	spores/unit	raw ct.	spores/unit
Ascospores						
Aureobasidium						
Basidiospores						
Bipolaris/Drechslera group						
Botrytis						
Chaetomium						
Cladosporium			108	110,000	101	100,000
Curvularia						
Epicoccum						
Fusarium						
Myrothecium						
Nigrospora						
Other colorless						
Penicillium/Aspergillus types†						
Pithomyces						
Rusts						
Smuts, Periconia, Myxomycetes						
Stachybotrys						
Stemphylium						
Torula						
Ulocladium						
Zygomycetes						
Background debris (1-4+)††	< 1+		1+		2+	
Sample size	1		1		1	
Unit	1 cm2		1 cm2		1 cm2	
§ TOTAL SPORES/UNIT		< 1		110,000		100,000

Comments: A) No spores detected.

† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium*, *Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.

†† Background debris is an indication of the amount of non-biological particulate matter present on the slide (dust in the air) and is graded from 1+ to 4+ with 4+ indicating the largest amounts. This background material is also an indication of visibility for the analyst and resultant difficulty reading the slide. For example, high background debris may obscure the small spores such as the *Penicillium/Aspergillus* group. Counts from areas with 4+ background debris should be regarded as minimal counts and may actually be higher than reported.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

§ Total Spores/unit has been rounded to two significant figures to reflect analytical precision.

The limit of detection is 1 spore per area analyzed.

The analytical sensitivity is (1 Spore/Total Number of Fields Observed)*(Total Sample Area(cm2)/Field Area of the microscope objective (cm2))*(1/unit volume)*Dilution Factor.

For more information regarding analytical sensitivity, please contact QA by calling the laboratory.

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

Client: Terracon - Pensacola
C/O: Mr. Michael Cobb
Re: EA187092; SOE WarehouseDate of Sampling: 10-11-2018
Date of Receipt: 10-12-2018
Date of Report: 10-15-2018**QUANTITATIVE SPORE COUNT REPORT**

Location:	T-3: Vinyl-Backed Fiber Ins. 209		T-4: Vinyl-Backed Fiber Ins. 213		T-5: Vinyl-Backed Fiber Ins. 212	
Comments (see below)	A		A		None	
Sample type	Tape sample		Tape sample		Tape sample	
Lab ID-Version†:	9537900-1		9537901-1		9537902-1	
Analysis Date:	10/15/2018		10/15/2018		10/15/2018	
	raw ct.	spores/unit	raw ct.	spores/unit	raw ct.	spores/unit
Ascospores						
Aureobasidium						
Basidiospores					2	2
Bipolaris/Drechslera group						
Botrytis						
Chaetomium						
Cladosporium						
Curvularia						
Epicoccum						
Fusarium						
Myrothecium						
Nigrospora						
Other colorless						
Penicillium/Aspergillus types†						
Pithomyces						
Rusts						
Smuts, Periconia, Myxomycetes						
Stachybotrys						
Stemphylium						
Torula						
Ulocladium						
Zygomycetes						
Background debris (1-4+)††	2+		2+		2+	
Sample size	1		1		1	
Unit	1 cm2		1 cm2		1 cm2	
§ TOTAL SPORES/UNIT		< 1		< 1		2

Comments: A) No spores detected.† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium*, *Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.†† Background debris is an indication of the amount of non-biological particulate matter present on the slide (dust in the air) and is graded from 1+ to 4+ with 4+ indicating the largest amounts. This background material is also an indication of visibility for the analyst and resultant difficulty reading the slide. For example, high background debris may obscure the small spores such as the *Penicillium/Aspergillus* group. Counts from areas with 4+ background debris should be regarded as minimal counts and may actually be higher than reported.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

§ Total Spores/unit has been rounded to two significant figures to reflect analytical precision.

The limit of detection is 1 spore per area analyzed.

The analytical sensitivity is (1 Spore/Total Number of Fields Observed)*(Total Sample Area(cm2)/Field Area of the microscope objective (cm2))*(1/unit volume)*Dilution Factor.

For more information regarding analytical sensitivity, please contact QA by calling the laboratory.

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

Client: Terracon - Pensacola
C/O: Mr. Michael Cobb
Re: EA187092; SOE Warehouse

Date of Sampling: 10-11-2018
Date of Receipt: 10-12-2018
Date of Report: 10-15-2018

QUANTITATIVE SPORE COUNT REPORT

Location:	T-6: Fiberglass Insulation Balcony		T-7: Metal Crown Flashing Rear Mezzanine		T-8: Vinyl-Backed Fiber Ins. Rear Mezzanine	
Comments (see below)	None		None		None	
Sample type	Tape sample		Tape sample		Tape sample	
Lab ID-Version†:	9537903-1		9537904-1		9537905-1	
Analysis Date:	10/15/2018		10/15/2018		10/15/2018	
	raw ct.	spores/unit	raw ct.	spores/unit	raw ct.	spores/unit
Ascospores	8	130				
Aureobasidium						
Basidiospores	12	200				
Bipolaris/Drechslera group						
Botrytis						
Chaetomium						
Cladosporium	525	8,800	134	130,000	118	120,000
Curvularia						
Epicoccum						
Fusarium						
Myrothecium						
Nigrospora						
Other colorless						
Penicillium/Aspergillus types†	3	50				
Pithomyces						
Rusts						
Smuts, Periconia, Myxomycetes						
Stachybotrys						
Stemphylium						
Torula						
Ulocladium						
Zygomycetes						
Background debris (1-4+)††	3+		2+		1+	
Sample size	1		1		1	
Unit	1 cm2		1 cm2		1 cm2	
§ TOTAL SPORES/UNIT		9,100		130,000		120,000

Comments:

† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium*, *Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.

†† Background debris is an indication of the amount of non-biological particulate matter present on the slide (dust in the air) and is graded from 1+ to 4+ with 4+ indicating the largest amounts. This background material is also an indication of visibility for the analyst and resultant difficulty reading the slide. For example, high background debris may obscure the small spores such as the *Penicillium/Aspergillus* group. Counts from areas with 4+ background debris should be regarded as minimal counts and may actually be higher than reported.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

§ Total Spores/unit has been rounded to two significant figures to reflect analytical precision.

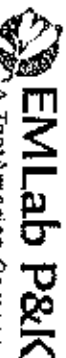
The limit of detection is 1 spore per area analyzed.

The analytical sensitivity is (1 Spore/Total Number of Fields Observed)*(Total Sample Area(cm2)/Field Area of the microscope objective (cm2))*(1/unit volume)*Dilution Factor.

For more information regarding analytical sensitivity, please contact QA by calling the laboratory.

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

CHAIN OF CUSTODY



New Jersey: 3000 Lincoln Drive East, Suite A, Marlton, NJ 08053 * (866) 871-1964
 Phoenix, AZ: 1501 West Knudsen Drive, Phoenix, AZ 85027 * (602) 851-4802
 SFS, CA: 6000 Shoreline Court, Suite 205, South San Francisco, CA 94080 * (866) 868-8655

Weather	Fog	Rain	Snow	Wind	Clear
Micro	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Light	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Moderate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heavy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



002021522

CONTACT INFORMATION

Company:	Terraco - Pensacola (31366)	Address:	9900 North Davis Highway, Pensacola, FL 32514 USA
Contact:	Mr. Michael Cobb	Special Instructions:	
Phone:	850-477-0434		

PROJECT INFORMATION

Project ID:	EA87092	STD - Standard (DEFAULT)
Project Description:	SOE Warehouse	ND - Next Business Day
Project Zip Code:		SD - Same Business Day Rush
PO Number:		WH - Weekend / Holiday
Sample ID		Sample Type (below)
		TAT (above)
		Total Volume / Area (as applicable)
		Notes (Time of day, Temp, RH, etc.)

TURN AROUND TIME CODES (TAT)

Rushes received after 2 pm or on weekends, will be considered received the next business day. Please alert us in advance of weekend analysis needs.

Sample ID	Description	Sample Type (below)	TAT (above)	Total Volume / Area (as applicable)	Notes (Time of day, Temp, RH, etc.)
T-1	Black	T	ND	---	---
T-2	Vinyl-backed Fiberglass Ins. 201			11:20	
T-3	Vinyl-backed Fiberglass Ins. 207			11:20	
T-4	Vinyl-backed Fiberglass Ins. 209			11:30	
T-5	Vinyl-backed Fiberglass Ins. 213			11:35	
T-6	Vinyl-backed Fiberglass Ins. 212			11:40	
T-7	Fiberglass Insulation balcony			11:45	
T-8	Metal crown flashing insulation			11:50	
T-9	Vinyl-backed Fiberglass Ins. 214			11:55	

Non-Culturable	Culturable	Other Requests
Spore Trap Analysis	BioCassette™, Andersen SAS, Swab, Water, Bulk, Dust, Soil, Contact Plates	
Spore Trap Analysis - Other particles		
Direct Microscopic Exam (Qualitative)		
Quantitative Spore Count (Check Exam)		
1-Media Surface Fungi (Genus ID + Asp. spp.)		
2-Media Surface Fungi (Genus ID + Asp. spp.)		
3-Media Surface Fungi (Genus ID + Asp. spp.)		
Culturable Air Fungi (Genus ID + Asp. spp.)		
Gram Stain & Counts (Culturable Air & Surface Bacteria)		
Legionella culture		
Total Coliform, E. coli (Presence/Absence)		
Mycoplasmata Filtration (specify organism)		
MPN Bacteria (specify organism)		
QuantTray - Sewage Screen		
Asbestos Analysis - PCM Airborne Fiber Count (NIOSH 7400)		
Asbestos Analysis - PLM (EPA method 600/4-93-110)		
PCR (specify test)		

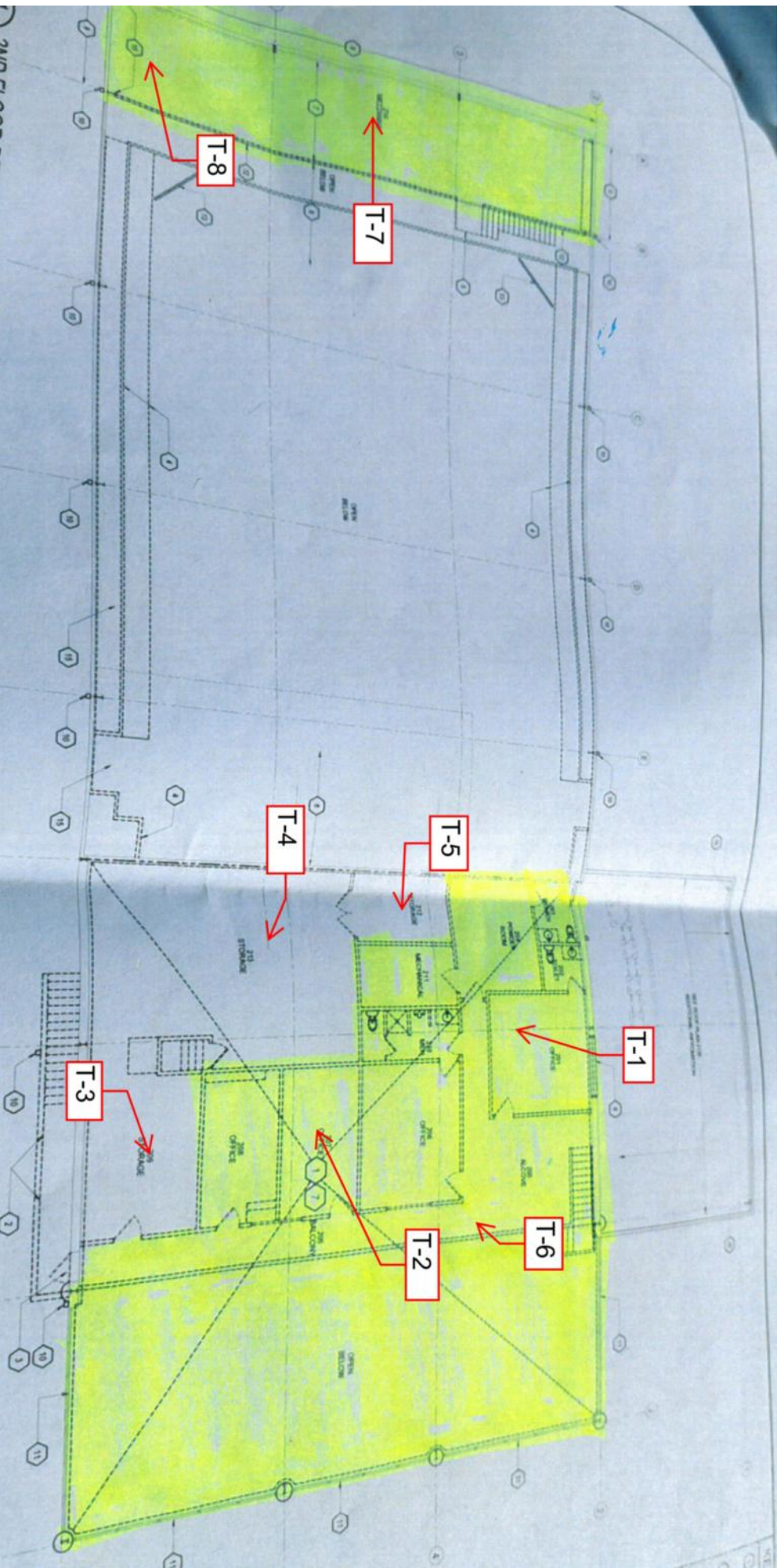
SAMPLE TYPE CODES		RELINQUISHED BY		DATE & TIME	
BC - BioCassette™	ST - Spore Trap, Zefon	T - Tape	D - Dust		
AIS - Anderson	AB - Andersen, Burkard	SW - Swab	SO - Soil		
SAS - Surface Air Sampler	P - Portable Water	B - Bulk			
CP - Contact Plate	NP - Non-Portable Water	O - Other			

By submitting this Chain of Custody, you agree to be bound by the terms and conditions set forth at <http://www.emlab.com/chainofcustodyterms.html>

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APPENDIX B

Sample Location Plan



Legend
 Areas highlighted in yellow indicate microbial growth.

← **T-#** Tape lift sample location



DIAGRAM IS INTENDED FOR GENERAL USE ONLY, AND IS NOT FOR CONSTRUCTION PURPOSES. LOCATIONS ARE APPROXIMATE

Project Mgr:	MRC
Approved By:	MRC
Checked By:	MRC
Drawn By:	DBM

Project No.	EA187092
Scale:	NOT TO SCALE
Date:	10/16/18
File No.	EA187092E2.dwg



Terracon
 Consulting Engineers and Scientists

9900 NORTH DAVIS HIGHWAY
 PH. (850) 477-9454

PENSACOLA, FL 32514
 FAX. (850) 477-6534

SAMPLE LOCATION DIAGRAM

LIMITED MOLD ASSESSMENT REPORT- DESIGNATED AREAS

SOE WAREHOUSE

3201 WEST NAVY BOULEVARD

PENSACOLA, FLORIDA

Appendix C

Photographs



Photo 1: Microbial growth on vinyl-faced insulation within Office 207.



Photo 2: Microbial growth on vinyl-faced insulation within Office 201.



Photo 3: Microbial growth on vinyl-faced insulation within the rear mezzanine.



Photo 4: Microbial growth on metal crown flashing within the rear mezzanine.

APPENDIX D

License



RICK SCOTT, GOVERNOR

JONATHAN ZACHEM, SECRETARY



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Hazardous Materials Survey Report

**New Supervisor of Elections Warehouse
(Former Auto Dealership and Church)
3201 West Navy Boulevard**

Pensacola, FL

April 25, 2018

Terracon Project No. EA187023



Prepared for:

Design and Construction Administration-
Escambia County Facilities Management
Pensacola, FL

Prepared by:

Terracon Consultants, Inc.
Pensacola, Florida

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Terracon

Geotechnical ■ Environmental ■ Construction Materials ■ Facilities

April 25, 2018

George Bush, Division Manager
Design and Construction Administration- Escambia County Facilities Management
100 E. Blount Street
Pensacola, Florida 32501

Telephone: (850) 595-3190
E-mail: gcbush@myescambiacounty.com

Re: Hazardous Material Survey Report
New Supervisor of Elections Warehouse (Former Auto Dealership and Church)
3201 West Navy Boulevard
Pensacola, Florida
Terracon Project No. EA187023

Dear Mr. Bush:

Terracon Consultants, Inc. (Terracon) is pleased to submit the attached report for the above referenced project to Design and Construction Administration- Escambia County Facilities Management. The purpose of this report is to present the results of the hazardous materials survey and analysis performed at the New Supervisor of Elections Warehouse (Former Auto Dealership) building located at 3201 West Navy Boulevard in Pensacola, Florida. The survey was conducted on April 5, 2018 in general accordance with Terracon's proposal PEA187023 dated February 20, 2018. We understand that the survey was requested due to planned renovations associated with the site.

Terracon appreciates the opportunity to provide this service to Design and Construction Administration-Escambia County Facilities Management. If you have any questions regarding this report please contact the undersigned at 850-474-0454.

Sincerely,

Terracon Consultants, Inc.

Asbestos Business License No. ZA-337



Michael R. Cobb
Project Industrial Hygienist


 For:
Russell E. Stauffer, P.E.
Authorized Project Reviewer
Licensed Asbestos Consultant EA-16

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HAZARDOUS MATERIALS SURVEY REPORT

New Supervisor of Elections Warehouse

(Former Auto Dealership and Church)

3201 West Navy Boulevard

Pensacola, Florida

Terracon Project No. EA187023

April 25, 2018

1.0 INTRODUCTION

Terracon conducted a hazardous materials survey of the New Supervisor of Elections Warehouse located at 3201 West Navy Boulevard in Pensacola, Florida. The facility was initially an auto dealership prior to being converted into a church. The survey was conducted on April 5, 2018 by Terracon's State of Florida approved asbestos building inspector Michael Cobb in accordance with Terracon's proposal PEA187023 dated February 20, 2018. Interior and exterior building components with limited roof access were surveyed and homogeneous areas of suspect asbestos-containing materials (ACM), suspect lead containing paint (LCP) and suspect lead containing components (LCC) were visually identified and documented. Although reasonable effort was made to survey accessible suspect materials, additional suspect but un-sampled materials could be located in walls, in voids, below the ground or in other concealed areas. Suspect ACM samples were collected in general accordance with the sampling protocols outlined in EPA regulation 40 CFR 763 (Asbestos Hazard Emergency Response Act, AHERA). Asbestos samples were delivered to an accredited laboratory for analysis. Suspect ACM samples were analyzed by Polarized Light Microscopy (PLM). Limited paint chip samples were obtained from representative surfaces potentially containing lead containing coatings and analyzed by Flame Atomic Absorption (FAA) method for confirmation of lead content. In addition a visual survey was conducted to identify other suspect hazardous and/or regulated materials at the facility.

1.1 Project Objective

We understand the survey was requested to identify the presence of asbestos, lead containing paint, lead containing components, and hazardous and/or regulated materials. The asbestos NESHAP (40 CFR Part 61, Subpart M) regulates asbestos fiber emissions and asbestos waste disposal practices. The NESHAP regulation also requires the identification and classification of existing ACM according to friability prior to demolition activities. In addition, asbestos and/or lead-containing components are subjected to other regulations including the Occupational Safety and Health Administration (OSHA) and State of Florida. Hazardous or regulated materials are primarily subject to the local, state, and federal regulations.

2.0 ASBESTOS SURVEY

2.1 Field Activities

The survey was conducted by Mr. Michael Cobb who is a State of Florida AHERA-accredited asbestos inspector from Terracon. Copies of the applicable asbestos licenses and Mr. Cobb's inspector certificate are attached in Appendix E. The survey was conducted in general accordance with the sample collection protocols established in EPA regulation 40 CFR 763, the Asbestos Hazard Emergency Response Act (AHERA). A summary of survey activities for the New Supervisor of Elections Warehouse (Former Auto Dealership) is provided below.

2.1.1 Visual Assessment

Survey activities were initiated with visual observations of the building's interior and exterior with limited roof access to identify homogeneous areas of suspect ACM. A homogeneous area (HA) consists of building materials that appear similar throughout in terms of color and texture with consideration given to the date of application. The assessment was conducted in visually accessible interior and exterior areas. The building was occupied with Escambia County facility workers who were there to evaluate and supervisor utilities being cut on.

It should be noted, that the building's roof system is comprised of a corrugated metal roofing system and due to safety concerns could not be entirely accessed. Therefore, suspect materials may be present in connection with the roofing system and are assumed to contain asbestos until proven otherwise by laboratory analysis.

Building materials identified as glass, wood, masonry, metal or rubber were not considered suspect ACM.

2.1.2 Physical Assessment

A physical assessment of each homogeneous area of suspect ACM was conducted to assess the friability and condition of the materials. A friable material is defined by the EPA as a material which can be crumbled, pulverized or reduced to powder by hand pressure when dry. Friability was assessed by physically touching suspect materials.

2.2 Sample Collection

Based on results of the visual observation, bulk samples of suspect ACM were collected in general accordance with USEPA AHERA sampling protocols. Samples of suspect materials were collected from randomly selected locations in each homogeneous area. Bulk samples were collected using wet methods as applicable to reduce the potential for fiber release. Samples were placed in sealable containers and labeled with unique sample numbers using an indelible marker.

The selection of sample locations and frequency of sampling were based on Terracon's observations and the assumption that like materials in the same area are homogeneous in content.

Terracon collected 80 bulk samples from 27 homogeneous areas of suspect ACM associated with the building. A summary of suspect ACM samples collected during the survey is included within Appendix A of this report.

2.3 Sample Analysis

Bulk samples were submitted under chain of custody to Cates Laboratories, Inc. (Cates) for analysis by Polarized Light Microscopy per EPA methodology EPA/600/R-93/116. The percentage of asbestos, where applicable, was determined by microscopic visual estimation. Cates is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP Accreditation No. 200569-0). The laboratory was instructed to analyze samples from each homogeneous area until the first sample containing asbestos (positive stop) was identified.

2.4 Regulatory Overview

The asbestos NESHAP (40 CFR Part 61, Subpart M) regulates asbestos fiber emissions and asbestos waste disposal practices. The NESHAP regulation also requires the identification and classification of existing ACM according to friability prior to demolition or renovation activity.

Under NESHAP, asbestos-containing building materials are classified as:

1. Friable ACM, or
2. Category I Non-Friable ACM, or
3. Category II Non-Friable ACM.

Friable materials are those that, when dry, may be crumbled, pulverized or reduced to powder by hand pressure. Category I Non-Friable ACM includes packings, gaskets, resilient floor coverings and asphalt roofing products containing more than 1% asbestos. Category II Non-Friable ACM are any materials other than Category I Non-Friable ACM that contain more than 1% asbestos.

Under NESHAP, Regulated Asbestos-Containing Materials (RACM) are classified as:

1. Friable ACM,
2. Category I Non-Friable ACM that is in poor condition and/or has become friable,
3. Category I Non-Friable ACM that will or has been subjected to sanding, grinding, cutting or abrading
4. Category II Non-Friable ACM that has a high probability of becoming or has become crumbled, pulverized or reduced to powder by the forces expected to act upon the material in the course of renovation or demolition operations.

In the State of Florida, asbestos activities are regulated by the Florida Department of Environmental Protection (FDEP). In addition, the Florida Department of Business and Professional Regulation (FDBPR) regulates licensing of asbestos related services.

Per the NESHAP, RACM must be removed prior to demolition activities that will disturb the materials. Removal of the ACM or RACM must be conducted by a State of Florida-licensed asbestos abatement contractor, in compliance with Florida Statute (F.S) 469.001-014. In addition, third party air monitoring could be performed during and following the abatement.

The Occupational Safety and Health Administration (OSHA) Asbestos standard for construction (29 CFR 1926.1101) regulates employee workplace exposure to asbestos. The OSHA standard has (2) Permissible Exposure Limits (PEL) that require employee exposure to airborne asbestos fibers be maintained below 0.1 asbestos fibers per cubic centimeter of air (0.1 f/cc) for an 8-hour Time-Weighted Average (8-Hr. TWA) and 1.0 f/cc for a 30-minute TWA (Excursion Limit. The OSHA standard classifies construction and maintenance activities which could disturb ACM, and specifies work practices and precautions which employers must follow when engaging in each class of regulated work.

2.5 Findings and Recommendations

Terracon performed an asbestos survey for the New Supervisor of Elections Warehouse (Former Auto Dealership) on April 9, 2018. Asbestos was not found in the samples analyzed. A summary table is located in Appendix A that identifies sample locations and summarizes laboratory results of building materials containing and suspected to contain asbestos. Appendix C contains asbestos analytical laboratory results.

2.5.1 Overview Recommendations

Generally stated, the NESHAP requires notification to the local regulatory agency ten (10) working days prior to renovation abatement activities if the any of the following threshold quantities of RACM are impacted: (1) 260 linear feet of piping, or (2) 160 square feet of other RACM, or (3) 35 cubic feet of debris. Notification is typically required to be electronically sent to the FDEP Northwest District.

The contractor must wait ten (10) working days (Monday – Friday) following the date of electronic notification before starting any RACM renovation and/or demolition activities. Any change to the start date of the demolition requires notification to the agency by phone, followed by a revision to the Notification Form. We recommend direct contact with the FDEP Northwest District (850.595.0616 ext. 1228) for confirmation and clarifications of their asbestos program requirements.

Laboratory analytical results are included in Appendix C.

3.0 LEAD CONTAINING PAINT AND COMPONENTS

3.1 Field Activities

The survey was conducted by Michael Cobb. A summary of survey activities is provided below.

3.1.1 Visual Observation

The LCP and LCC surveys were limited to readily observable and accessible surfaces excluding the building exterior. Terracon cannot guarantee a building or property to be LCP or LCC free as the possibility exists that LCP coated surfaces and LCC may be hidden from sight or in inaccessible locations, or the homogeneous construction areas identified may not be truly homogeneous. This LCP survey was not performed to comply with the HUD *Guidelines for the Evaluation and Control of Lead Containing Paint Hazards in Housing* standards although the testing was performed in general accordance with HUD protocols. It should be understood that this LCP survey is not considered to be comprehensive in nature, and the results are not intended to be used to determine lead hazards, develop abatement plans, or prepare detailed cost estimates for abatement.

3.1.2 Visual Assessment

Our survey activities began with visual observation of areas associated with the building's interior and exterior with limited roof access to identify apparent unique combinations of suspect LCP and LCC. A unique combination of paint is based on paint color, building component and substrate. Assessment was limited to visually accessible interior and exterior areas in the specified areas of the buildings.

3.2 Sample Analysis

Terracon performed a lead containing paint (LCP) survey that consisted of collecting paint chip samples to test coatings on individual building components.

Terracon conducted paint chip sampling that consisted of collecting 14 paint chip samples from the interior and exterior of the building. Paint chip samples were submitted under chain of custody to EMSL Analytical Inc. for analysis by flame atomic absorption spectrometry per EPA SW-846/3050B/7000B. EMSL is accredited under the Environmental Lead Laboratory Accreditation Program (ELLAP) (ELLAP Accreditation No. 163563).

3.3 Regulatory Overview

Lead is regulated by the EPA, HUD, FDEP and OSHA. The EPA and FDEP regulate lead use, removal, and disposal, and OSHA regulates lead exposure to workers. HUD regulates lead present in public housing. The EPA defines LCP as paint, varnish, stain, or other applied coating that contains lead equal to or greater than 1.0 mg/cm², 5,000 mg/kg, or 0.5% by dry weight as

determined by laboratory analysis. For the purpose of the OSHA lead standard, lead includes any detectable concentrations of metallic lead, all inorganic lead compounds, and organic lead soaps. A synopsis of the OSHA regulations (29 CFR 1926.62) and the applicability are as follows:

The OSHA *Lead Standard for Construction* (29 CFR 1926.62) applies to all construction work where an employee may be occupationally exposed to lead. All work related to construction, alteration, or repair (including painting and decorating) is included. **The lead-in-construction standard applies to any detectable concentration of lead in paint, as even small concentrations of lead can result in unacceptable employee exposures depending upon on the method of removal and other workplace conditions.**

Under the OSHA standard, construction includes, but is not limited to, the following:

- Demolition or salvage of structures where lead or materials containing lead are present
- Removal or encapsulation of materials containing lead
- New construction, alteration, repair, or renovation of structures, substrates, or portions containing lead, or materials containing lead
- Installation of products containing lead
- Lead contamination/emergency clean-up
- Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed
- Maintenance operations associated with construction activities described above

3.4 Findings and Recommendations

Terracon collected 14 paint chip samples from the interior and exterior of the building. Analytical results from the paint chip sampling event indicated that 13 out of 14 paint chip samples were below laboratory detection limits for lead. Sample SOE-P11 contained a reddish brown paint identified structural steel framework. A complete summary table of the paint chip sampling is listed in Appendix B of this report. Paint chip sampling analytical results are located in Appendix D.

No visible LCCs were observed from accessible areas of the roofing system.

If LCCs are encountered during renovations or maintenance activities, the LCC can be managed in place using an Operations and Maintenance Program (OMP).

Disturbance of any of the materials and/or components found to contain detectable levels of lead would require such activities be conducted in compliance with the requirements of the OSHA standard. The OSHA regulations require that exposures to construction workers and general industry personnel be controlled by proper work procedures, proper worker training, respiratory protection, etc. Any renovation/demolition actions should utilize the proper exposure assessments, training, engineering controls, etc., and comply with the OSHA Construction Standards for Lead (29 CFR 1926.62). As such, personnel disturbing materials/components would need to have the OSHA level required training, comply with the work practices, levels of potential

exposure documented and compared to the Action and Permissible Levels of 30 ug/m³ and 50 ug/m³, respectively.

Torch cutting metals coated with lead concentrations should be avoided. Areas that must be torch cut to facilitate component removal should have the torch cut area coatings removed by lead removal contractor personnel prior to the torch cutting in accordance with the requirements of the OSHA Lead Construction Standards.

In addition, disposal of the waste materials would be tested utilizing the Toxicity characteristic leaching procedure (TCLP) to document lead content and compared to the EPA and FDEP threshold of 5.0 mg/Liter and disposed of accordingly.

During demolition activities, the removal of LCP components and suspect LCC may need to be removed and segregated from the waste stream by a contractor with lead experience and training in accordance with the OSHA lead requirements.

Regarding LCP disposal, removed coatings and components should be segregated from the renovation/demolition waste stream and coatings tested for leachate lead in accordance with Toxicity Characteristics Leachate Procedure (TCLP).

Metal building components removed intact can be exempt from TCLP testing, if removed and sent for recycling. Recycled scrap metal would be exempt from EPA Resource Conservation and Recovery Act (RCRA), 40 CFR Part 261 and Florida Department of Environmental Protection (FDEP) Hazardous Waste Rules (per FDEP Solid Waste Memorandum SWM 21.36).

Any chips, dusts, contaminated soils and sludge containing lead based paint debris generated by the demolition or renovation would have to be characterized and managed in accordance with the RCRA and FDEP hazardous waste rules.

4.0 VISUAL REGULATED MATERIALS SURVEY

4.1 Regulatory Overview

The United States Environmental Protection Agency (USEPA) regulates bulk PCB product waste under 40 Code of Federal Regulations (CFR) 761.62 of the Toxic Substances Control Act (TSCA). Certain mercury-containing equipment is covered under the Universal Waste regulation (40 CFR 273.9); other mercury wastes are regulated under the Resource Conservation and Recovery Act (RCRA) and are considered hazardous if the waste exceeds the toxicity characteristic leachate procedure (TCLP) level of 0.2 milligrams per liter (mg/L) for mercury.

State of Florida hazardous materials regulations are addressed in Florida Administrative Code (FAC) rule 63.730- Hazardous Waste.

Hazardous Materials Survey Report

New Supervisor of Elections Warehouse (Former Auto Dealership and Church) ■ Pensacola, FL
April 25, 2018 ■ Terracon Project No. EA187023



Under Florida law, it is illegal to discard nickel / cadmium or lead / acid batteries as trash; the batteries must be recycled or sent to a facility permitted to dispose of those batteries.

Equipment such as transformers may contain mineral oil with minor amounts of PCBs and could be considered "PCB contaminated" (PCB content 50-500 ppm).

Equipment such as heating ventilation and air conditioning (HVAC) systems, chillers, and refrigerators may contain ozone depleting substances also known as chlouroflouro carbons (CFCs). CFCs are regulated under 40 CFR 82 and the Florida Administrative Code (FAC) 62-204.800.

The generator is responsible for compliance with applicable regulations regarding hazardous waste disposal.

4.2 Findings and Recommendations

Findings

The following table identifies materials likely to contain hazardous and regulated materials.

Material	Location	Approximate Quantity
Light Ballasts - PCBs	Throughout Building	99
Light Fluorescent Tubes - Mercury	Throughout Building	263
Compact Fluorescent Bulbs-Mercury	Throughout Building	6
High Intensity Discharge (HID) Lamp – Mercury and or Lead	Emergency Exits	7
HVAC Units - CFCs	Building Exterior	5
Water Fountain - CFCs	Bathroom Hallway	1

Recommendations

Contractors performing removal, disposal or recycling activities should employ engineering and work controls to maintain exposures below applicable levels and should be trained in the provisions of OSHA 29 CFR 1910.120 (Hazard Communication) and 29 CFR 1910.1200 (Hazardous Waste Operations), at a minimum. We also suggest that the contractor performing removal of the identified materials contact the selected disposal / recycling facility prior to transport to determine if any modified procedures are necessary.

5.0 GENERAL COMMENTS

This asbestos, lead containing paint survey, and the visual hazardous regulated materials survey were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the same locale. The results, findings, conclusions and recommendations expressed in this report are based on conditions observed during our survey of the buildings. The information contained in this report is relevant to the date on which this survey was performed, and should not be relied upon to represent conditions at a later date. This report has been prepared on behalf of and exclusively for use by Design and Construction Administration-Escambia County Facilities Management. This report is not a bidding document. Contractors or consultants reviewing this report must draw their own conclusions regarding further investigation or remediation deemed necessary. Terracon does not warrant the work of regulatory agencies, laboratories or other third parties supplying information which may have been used in the preparation of this report. No warranty, express or implied is made.

APPENDIX A

ASBESTOS SURVEY SAMPLE SUMMARY

APPENDIX A
ASBESTOS SAMPLE SUMMARY
New Supervisor of Elections Warehouse (Former Auto Dealership)

HA No.	Sample No.	Location	Bulk Sample Material Description	Material Description by Layer	Lab Results
1	SOE-1A	Sales Floor	9" x 9" Brown Ceramic Floor Tile with Grout	Ceramic Tile	None Detected
	SOE-1A	Sales Floor		Grout	None Detected
	SOE-1A	Sales Floor		Thinset	None Detected
	SOE-1B	Office Hallway 1st Floor	9" x 9" Brown Ceramic Floor Tile with Grout	Ceramic Tile	None Detected
	SOE-1B	Office Hallway 1st Floor		Grout	None Detected
	SOE-1B	Office Hallway 1st Floor		Thinset	None Detected
	SOE-1C	Bathroom Hallway	9" x 9" Brown Ceramic Floor Tile with Grout	Ceramic Tile	None Detected
	SOE-1C	Bathroom Hallway		Grout	None Detected
	SOE-1C	Bathroom Hallway		Thinset	None Detected
2	SOE-2A	Office #2	Wood Pattern Peel and Stick Flooring	Floor Tile	None Detected
	SOE-2A	Office #2		Clear Adhesive	None Detected
	SOE-2B	Office #4	Wood Pattern Peel and Stick Flooring	Floor Tile	None Detected
	SOE-2B	Office #4		Clear Adhesive	None Detected
	SOE-2C	Lounge behind Chapel	Wood Pattern Peel and Stick Flooring	Floor Tile	None Detected
	SOE-2C	Lounge behind Chapel		Clear Adhesive	None Detected
3	SOE-3A	Women's Restroom, 1st Floor	14" x 14" Beige Ceramic Tile with Grout	Ceramic Tile	None Detected
	SOE-3A	Women's Restroom, 1st Floor		Grout	None Detected
	SOE-3A	Women's Restroom, 1st Floor		Thinset	None Detected
	SOE-3B	Women's Restroom, 1st Floor	14" x 14" Beige Ceramic Tile with Grout	Ceramic Tile	None Detected
	SOE-3B	Women's Restroom, 1st Floor		Grout	None Detected
	SOE-3B	Women's Restroom, 1st Floor		Thinset	None Detected
	SOE-3C	Women's Restroom, 1st Floor	14" x 14" Beige Ceramic Tile with Grout	Ceramic Tile	None Detected
	SOE-3C	Women's Restroom, 1st Floor		Grout	None Detected
	SOE-3C	Women's Restroom, 1st Floor		Thinset	None Detected
4	SOE-4A	Storefront, Northwest Corner	Black Interior Caulking	Caulking	None Detected
	SOE-4B	Storefront, Northeast Corner	Black Interior Caulking	Caulking	None Detected
	SOE-4C	Storefront, Central Area	Black Interior Caulking	Caulking	None Detected
5	SOE-5A	Office #1	Gray & White Wall Paper	Wall Covering	None Detected
	SOE-5B	Office #10	Gray & White Wall Paper	Wall Covering	None Detected
	SOE-5C	1st Floor Restroom Hallway	Gray & White Wall Paper	Wall Covering	None Detected
6	SOE-6A	Office #6	Yellow Carpet Mastic	Yellow Mastic	None Detected
	SOE-6B	Office #7	Yellow Carpet Mastic	Yellow Mastic	None Detected
	SOE-6C	2nd Floor Hallway by Break Room	Yellow Carpet Mastic	Yellow Mastic	None Detected
7	SOE-7A	Former Daycare Room	Green Carpet Mastic	Green Mastic	None Detected
	SOE-7B	Former Daycare Room	Green Carpet Mastic	Green Mastic	None Detected
	SOE-7C	Former Daycare Room	Green Carpet Mastic	Green Mastic	None Detected
8	SOE-8A	Former Daycare Room	12" x 12" Grey and White Floor Tile with Yellow Mastic	Yellow Mastic	None Detected
	SOE-8A	Former Daycare Room		Floor Tile	None Detected
	SOE-8A	Former Daycare Room		Yellow Mastic	None Detected
	SOE-8B	Former Daycare Room	12" x 12" Grey and White Floor Tile with Yellow Mastic	Yellow Mastic	None Detected
	SOE-8B	Former Daycare Room		Floor Tile	None Detected
	SOE-8B	Former Daycare Room		Yellow Mastic	None Detected
	SOE-8C	Former Daycare Room	12" x 12" Grey and White Floor Tile with Yellow Mastic	Yellow Mastic	None Detected
	SOE-8C	Former Daycare Room		Floor Tile	None Detected
	SOE-8C	Former Daycare Room		Yellow Mastic	None Detected
9	SOE-9A	Women's Restroom, 1st Floor	Smooth Wallboard Ceiling	Paint Layer	None Detected
	SOE-9A	Women's Restroom, 1st Floor		Paper	None Detected
	SOE-9A	Women's Restroom, 1st Floor		Wallboard Material	None Detected
	SOE-9B	Southeast Storage Room	Smooth Wallboard Ceiling	Paint Layer	None Detected
	SOE-9B	Southeast Storage Room		Paper	None Detected
	SOE-9B	Southeast Storage Room		Wallboard Material	None Detected
	SOE-9C	Southeast Storage Room	Smooth Wallboard Ceiling	Paint Layer	None Detected
	SOE-9C	Southeast Storage Room		Joint Compound	None Detected
	SOE-9C	Southeast Storage Room		Paper	None Detected
	SOE-9C	Southeast Storage Room		Wallboard Material	None Detected

APPENDIX A
ASBESTOS SAMPLE SUMMARY
New Supervisor of Elections Warehouse (Former Auto Dealership)

HA No.	Sample No.	Location	Bulk Sample Material Description	Material Description by Layer	Lab Results
10	SOE-10A	Women's Restroom, 1st Floor	Textured Wallboard on Walls	Paint Texture	None Detected
	SOE-10A	Women's Restroom, 1st Floor		Joint Tape	None Detected
	SOE-10A	Women's Restroom, 1st Floor		Joint Compound	None Detected
	SOE-10A	Women's Restroom, 1st Floor		Paper	None Detected
	SOE-10A	Women's Restroom, 1st Floor		Wallboard Material	None Detected
	SOE-10B	1st Floor, Restroom Hall	Textured Wallboard on Walls	Paint Texture	None Detected
	SOE-10B	1st Floor, Restroom Hall		Joint Compound	None Detected
	SOE-10B	1st Floor, Restroom Hall		Paper	None Detected
	SOE-10B	1st Floor, Restroom Hall		Wallboard Material	None Detected
	SOE-10C	Chapel	Textured Wallboard on Walls	Paint Texture	None Detected
	SOE-10C	Chapel		Joint Tape	None Detected
	SOE-10C	Chapel		Joint Compound	None Detected
	SOE-10C	Chapel		Paper	None Detected
	SOE-10C	Chapel		Wallboard Material	None Detected
	SOE-10D	Chapel	Textured Wallboard on Walls	Paint Texture	None Detected
	SOE-10D	Chapel		Joint Tape	None Detected
	SOE-10D	Chapel		Joint Compound	None Detected
	SOE-10D	Chapel		Paper	None Detected
	SOE-10D	Chapel		Wallboard Material	None Detected
	SOE-10E	Chapel	Textured Wallboard on Walls	Paint Texture	None Detected
	SOE-10E	Chapel		Joint Tape	None Detected
	SOE-10E	Chapel		Joint Compound	None Detected
	SOE-10E	Chapel		Paper	None Detected
	SOE-10E	Chapel		Wallboard Material	None Detected
11	SOE-11A	Office #13	Black Mastic on Plywood Flooring	Black Mastic	None Detected
	SOE-11B	Office #13	Black Mastic on Plywood Flooring	Black Mastic	None Detected
	SOE-11C	Office #13	Black Mastic on Plywood Flooring	Black Mastic	None Detected
12	SOE-12A	1st Floor, Women's Restroom Storage	Non-Textured Wallboard with Joint Compound	Paint Layer	None Detected
	SOE-12A	1st Floor, Women's Restroom Storage		Joint Tape	None Detected
	SOE-12A	1st Floor, Women's Restroom Storage		Joint Compound	None Detected
	SOE-12A	1st Floor, Women's Restroom Storage		Paper	None Detected
	SOE-12A	1st Floor, Women's Restroom Storage		Wallboard Material	None Detected
	SOE-12B	Office #13	Non-Textured Wallboard with Joint Compound	Paint Layer	None Detected
	SOE-12B	Office #13		Joint Compound	None Detected
	SOE-12B	Office #13		Paper	None Detected
	SOE-12B	Office #13		Wallboard Material	None Detected
	SOE-12C	Office #10, Restroom	Non-Textured Wallboard with Joint Compound	Paint Layer	None Detected
	SOE-12C	Office #10, Restroom		Joint Tape	None Detected
	SOE-12C	Office #10, Restroom		Joint Compound	None Detected
	SOE-12C	Office #10, Restroom		Paper	None Detected
	SOE-12C	Office #10, Restroom		Wallboard Material	None Detected
13	SOE-13A	Office #10, Restroom	12" x 12" Brown, Gray, and White Colored Floor Tile with Yellow Mastic	Floor Tile	None Detected
	SOE-13A	Office #10, Restroom	12" x 12" Brown, Gray, and White Colored Floor Tile with Yellow Mastic	Yellow Mastic	None Detected
	SOE-13B	Men's Restroom, 2nd Floor	12" x 12" Brown, Gray, and White Colored Floor Tile with Yellow Mastic	Floor Tile	None Detected
	SOE-13B	Men's Restroom, 2nd Floor	12" x 12" Brown, Gray, and White Colored Floor Tile with Yellow Mastic	Yellow Mastic	None Detected
	SOE-13C	Women's Restroom, 2nd Floor	12" x 12" Brown, Gray, and White Colored Floor Tile with Yellow Mastic	Floor Tile	None Detected
	SOE-13C	Women's Restroom, 2nd Floor	12" x 12" Brown, Gray, and White Colored Floor Tile with Yellow Mastic	Yellow Mastic	None Detected
14	SOE-14A	Office #10, Restroom	4" Brown Cove Base with Yellow Mastic	Cove Base	None Detected
	SOE-14A	Office #10, Restroom		Yellow Mastic	None Detected
	SOE-14B	Women's Restroom, 2nd Floor	4" Brown Cove Base with Yellow Mastic	Cove Base	None Detected
	SOE-14B	Women's Restroom, 2nd Floor		Yellow Mastic	None Detected
	SOE-14C	Chapel	4" Brown Cove Base with Yellow Mastic	Cove Base	None Detected
	SOE-14C	Chapel		Yellow Mastic	None Detected
15	SOE-15A	Storage adjacent to Break Room	Blue Painted CMU with Mortar	Paint Layer	None Detected
	SOE-15A	Storage adjacent to Break Room		CMU Block	None Detected
	SOE-15A	Storage adjacent to Break Room		Mortar	None Detected
	SOE-15B	Chapel, North Wall	Blue Painted CMU with Mortar	Filler/Texture	None Detected
	SOE-15B	Chapel, North Wall		CMU Block	None Detected
	SOE-15B	Chapel, North Wall		Mortar	None Detected
	SOE-15C	Lounge behind Chapel	Blue Painted CMU with Mortar	Filler/Texture	None Detected
	SOE-15C	Lounge behind Chapel		CMU Block	None Detected
	SOE-15C	Lounge behind Chapel		Mortar	None Detected

APPENDIX A
ASBESTOS SAMPLE SUMMARY
New Supervisor of Elections Warehouse (Former Auto Dealership)

HA No.	Sample No.	Location	Bulk Sample Material Description	Material Description by Layer	Lab Results
16	SOE-16A	HVAC Room, 2nd Floor	White HVAC Duct Mastic	White Mastic	None Detected
	SOE-16A	HVAC Room, 2nd Floor		Wrap	None Detected
	SOE-16A	HVAC Room, 2nd Floor		Insulation	None Detected
	SOE-16B	HVAC Room, 2nd Floor	White HVAC Duct Mastic	White Mastic	None Detected
	SOE-16B	HVAC Room, 2nd Floor		Wrap	None Detected
	SOE-16B	HVAC Room, 2nd Floor		Insulation	None Detected
	SOE-16C	HVAC Room, 2nd Floor	White HVAC Duct Mastic	White Mastic	None Detected
	SOE-16C	HVAC Room, 2nd Floor		Wrap	None Detected
	SOE-16C	HVAC Room, 2nd Floor		Insulation	None Detected
17	SOE-17A	HVAC Room, 2nd Floor	Gray HVAC Duct Mastic	Grey Mastic	None Detected
	SOE-17B	HVAC Room, 2nd Floor	Gray HVAC Duct Mastic	Grey Mastic	None Detected
	SOE-17C	HVAC Room, 2nd Floor	Gray HVAC Duct Mastic	Grey Mastic	None Detected
18	SOE-18A	HVAC Room, 2nd Floor	Black HVAC Duct Mastic	Black Mastic	None Detected
19	SOE-19A	Second Floor Hallway	Paper Backing on Yellow Ceiling Insulation	Wrap/Mastic	None Detected
	SOE-19A	Second Floor Hallway		Insulation	None Detected
	SOE-19B	Second Floor Hallway	Paper Backing on Yellow Ceiling Insulation	Wrap/Mastic	None Detected
	SOE-19B	Second Floor Hallway		Insulation	None Detected
	SOE-19C	Second Floor Hallway	Paper Backing on Yellow Ceiling Insulation	Wrap/Mastic	None Detected
	SOE-19C	Second Floor Hallway		Insulation	None Detected
20	SOE-20A	Chapel Entry, West	Floor Filler	Floor Filler	None Detected
	SOE-20B	Chapel Entry, West	Floor Filler	Floor Filler	None Detected
	SOE-20C	Chapel Entry, East	Floor Filler	Floor Filler	None Detected
21	SOE-21A	Northwest Corner of Building	Building Slab	Concrete	None Detected
	SOE-21B	Chapel Custodial Closet	Building Slab	Paint Layer	None Detected
	SOE-21B	Chapel Custodial Closet		Concrete	None Detected
	SOE-21C	Storage behind Chapel	Building Slab	Concrete	None Detected
22	SOE-22A	Hall Bath Entry	Brown Exterior Caulking	Caulking	None Detected
	SOE-22B	Office #9, Window	Brown Exterior Caulking	Caulking	None Detected
	SOE-22C	East Office Hall Entry	Brown Exterior Caulking	Caulking	None Detected
23	SOE-23A	Chapel Entry, East	12" x 12" Marble Floor Tile with Grout and Thinset	Marble Tile	None Detected
	SOE-23A	Chapel Entry, East		Grout	None Detected
	SOE-23A	Chapel Entry, East		Thinset	None Detected
	SOE-23B	Chapel Entry, West	12" x 12" Marble Floor Tile with Grout and Thinset	Marble Tile	None Detected
	SOE-23B	Chapel Entry, West		Grout	None Detected
	SOE-23B	Chapel Entry, West		Thinset	None Detected
24	SOE-24A	Break Room, West Wall	Unfinished Drywall	Joint Tape	None Detected
	SOE-24A	Break Room, West Wall		Joint Compound	None Detected
	SOE-24A	Break Room, West Wall		Paper	None Detected
	SOE-24A	Break Room, West Wall		Wallboard Material	None Detected
	SOE-24B	Break Room, East Wall	Unfinished Drywall	Joint Compound	None Detected
	SOE-24B	Break Room, East Wall		Paper	None Detected
	SOE-24B	Break Room, East Wall		Wallboard Material	None Detected
	SOE-24C	Storage Room by Break Room	Unfinished Drywall	Joint Compound	None Detected
	SOE-24C	Storage Room by Break Room		Paper	None Detected
	SOE-24C	Storage Room by Break Room		Wallboard Material	None Detected
25	SOE-25A	Awning	Concrete Columns	Paint Layer	None Detected
	SOE-25A	Awning		Concrete	None Detected
	SOE-25B	Awning	Concrete Columns	Paint Layer	None Detected
	SOE-25B	Awning		Concrete	None Detected
	SOE-25C	Awning	Concrete Columns	Paint Layer	None Detected
	SOE-25C	Awning		Concrete	None Detected
26	SOE-26A	Awning	Felt Paper Attached to Wooden Form Work within Concrete Column	Felt	None Detected
	SOE-26B	Awning	Felt Paper Attached to Wooden Form Work within Concrete Column	Felt	None Detected
	SOE-26C	Awning	Felt Paper Attached to Wooden Form Work within Concrete Column	Felt	None Detected
27	SOE-27A	on Lower Roof Level	White Exterior Roofing Caulk	Caulking	None Detected
	SOE-27B	on Lower Roof Level	White Exterior Roofing Caulk	Caulking	None Detected
	SOE-27C	on Lower Roof Level	White Exterior Roofing Caulk	Caulking	None Detected

APPENDIX B
LEAD-CONTAINING PAINT SURVEY SAMPLE SUMMARY

APPENDIX B
LEAD-CONTAINING PAINT SURVEY SAMPLE SUMMARY
New Supervisor of Elections Warehouse (Former Auto Dealership)

Sample No.	Sample Location	Component	Color	Substrate	Lab Results (% by weight)	Condition (Intact, Fair, or Poor)
SOE-P1	Office # 3	Door Frame	Gray	Wood	<0.008	Intact
SOE-P2	Second Floor Hallway	Wall	Light Gray	Wood Paneling	<0.008	Intact
SOE-P3	Office # 11	Baseboards, Doors, and Door Frames,	Stain	Wood	<0.0096	Intact
SOE-P4	Office # 10	Door Frames, Doors, and Baseboards	Greenish Gray	Wood	<0.008	Intact
SOE-P5	Break Room	Door Frames	White	Wood	<0.008	Intact
SOE-P6	Former Kids Area	Baseboards	Baby Blue	Wood	<0.008	Intact
SOE-P7	Former Kids Area	Walls	Light Blue	Wood Paneling	<0.008	Intact
SOE-P8	Chapel	Walls	White with Blue Undercoat	CMU Block	<0.008	Intact
SOE-P9	Chapel	Doors	Beige with Blue Undercoat	Metal	<0.008	Intact
SOE-P10	Chapel	Walls	Off-White	Wallboard	<0.008	Intact
SOE-P11	Break Room	Trusses	Reddish Brown	Steel	0.069	Intact
SOE-P12	Chapel	Floor	Purple	Concrete	<0.008	Intact
SOE-P13	Bay Door	Framing	Brown	Steel	<0.008	Poor Condition
SOE-P14	Mezzanine behind Chapel	Framing and Stairs	White	Wood	<0.008	Intact

Note: Material(s) highlighted in bold contained detectable levels of lead and are regulated by OSHA.

APPENDIX C

ASBESTOS ANALYTICAL LABORATORY DATA



CATES LABORATORIES

CHAIN OF CUSTODY

CL Project No. PLM-16721
(Lab Only) SAT-24904

Company: Terracon

Contact/Results to: Mike Cobb

Verbal ☐ Email ☒ Fax ☐ (check all that apply)

Email(s): _____

Telephone No.: _____

Fax No.: _____

Project Information

Project: SOE warehouse

Project No.: EA187023

Address: 3201 W. Navy Blvd

P.O. No.: _____

Turnaround (check one)

RUSH ASAP ☐

RUSH 24HR ☐

2 DAY (standard) ☐

3-4 DAY ☒

5 DAY ☐

Testing Services (check all that apply)

Asbestos

PLM-BULK

EPA 600/R-93/116 ☒
Point Count (400) ☐

PCM-AIR

NIOSH 7400 ☐
OSHA TWA ☐

IAQ - Mold (Non-Viable)

AIR (spore trap) - Standard Profile (count/genus identification) ☐

AIR (spore trap) - Expanded Profile (w/insect parts/pollen/skin) ☐

BULK (tape lift, swab) - Standard Profile (genus identification) ☐

CatesLab No. Range (Lab Only)

Sample Date

609484-609563

4-5-18

No. of Samples 80 Positive Stop: Yes ☒ No ☐

Sample No.	Sample Description/Location	Volume (air only)
SOE-1A	9"x9" Lt Brown ceramic Tile / front / Sales Floor	
SOE-1B	↓ / Office Hallway 1st Floor	
SOE-1C	↓ / Bathroom Hallway	
SOE-2A	Brown wood pattern peel stick flooring / Office #2	
SOE-2B	↓ / Office #4	
SOE-2C	↓ / Lounge Behind Chapel	
SOE-3A	14"x14" Beige ceramic Floor Tile / Women's RR 1st	
SOE-3B	↓	
SOE-3C	↓	
SOE-4A	Black interior caulking / Store Front NW corner	
SOE-4B	↓ / Store Front NE corner	
SOE-4C	↓ / Store Front Central Area	

Relinquished By:

Date/Time:

Received By:

Date/Time:

Michael Cole

4-6-18 1800

M. J. Miller

9:21 4/9/18

AF72017-09 - issued 4/3/2017

Walk-In ☐

D-Drop ☐

F-Drop ☐

FedEx ☒

UPS ☐

Lonestar ☐

USPS ☐

1339 Motor Circle, Dallas, TX 75207 * (214) 920-5006, Fax 1-972-767-0167

NVLAP Code 200569-0, TDSHS-Asbestos 30-0287, TDSHS-Mold LAB1034, AZ Lab Cert. AZ0948

1 of 4

Additional Sample Page

CL Project No. PLM-16721
(Lab Only) Sgt-24904

Project Name. SOE warehouse

Project No. EA187023

Sample No.	Sample Description/Location	Volume (air only)
SOE-5A	grey & white wall paper / office #1	
SOE-5B	↓ / office #10	
SOE-5C	↓ / 1st Floor Restroom Hallway	
SOE-6A	yellow carpet mastic / office #6	
SOE-6B	↓ / office #7	
SOE-6C	↓ / 2nd Floor Hallway by Break Room	
SOE-7A	green carpet mastic / Former Daycare Room	
SOE-7B	↓	
SOE-7C	↓	
SOE-8A	12" X 12" grey & white floor tile / Former Daycare Room	
SOE-8B	↓	
SOE-8C	↓	
SOE-9A	smooth wallboard ceiling / womens' R.R. Storage	
SOE-9B	↓ / SE Storage Room	
SOE-9C	↓	
SOE-10A	Textured wallboard on walls / womens' RR 1st FLR	
SOE-10B	↓ / 1st FLR Restroom Hall	
SOE-10C	↓ / Chapel	
SOE-10D	↓	
SOE-10E	↓	
SOE-11A	Black Mastic on plywood / office #13	
SOE-11B	↓	
SOE-11C	↓	
SOE-12A	Non-Textured wallboard / 1st FLR women's RR storage	
Relinquished By:		Date/Time:
Michael Cobb		4-6-18, 1800
Received By:		Date/Time:
M. J. Miller		9:21 4/9/18

AF72017-09 - issued 4/3/2017

1339 Motor Circle, Dallas, TX 75207 * (214) 920-5006, Fax 1-972-767-0167

NVLAP Code 200569-0, TDSHS-Asbestos 30-0287, TDSHS-Mold LAB1034, AZ Lab Cert AZ0948

2 of 4



CATES LABORATORIES

CHAIN OF CUSTODY

Additional Sample Page

CL Project No. PLU-16721
(Lab Only) SGT-24904

Project Name SOE warehouse

Project No EA187023

Sample No.	Sample Description/Location	Volume (air only)
SOE-12B	Non-textured wall bound / office #13	
SOE-12C	↓ / office #10 Restroom	
SOE-13A	Brown gray & white 12"x12" floor tile / office 10 RR	
SOE-13B	↓ / Mens' RR 2nd FLR	
SOE-13C	↓ / womens' RR 2nd FLR	
SOE-14A	4" Brown Cove Base w/ yellow mastic / office 10 RR	
SOE-14B	↓ / womens' RR 2nd FLR	
SOE-14C	↓ / chapel	
SOE-15A	CMU w/ mortar / storage adjacent to Break Room	
SOE-15B	↓ / chapel north wall	
SOE-15C	↓ / Lounge Behind chapel	
SOE-16A	white HVAC Duct Mastic / HVAC Room 2nd FLR	
SOE-16B	↓	
SOE-16C	↓	
SOE-17A	gray HVAC Duct Mastic / HVAC Room 2nd FLR	
SOE-17B	↓	
SOE-17C	↓	
SOE-18A	Black HVAC Duct Mastic / HVAC Room 2nd FLR	
SOE-19A	paper backing on yellow ceiling insulation	
SOE-19B	↓	
SOE-19C	↓	
SOE-20A	Floor Filler / chapel entry west	
SOE-20B	↓	
SOE-20C	↓ / chapel entry east	
Relinquished By:		Date/Time:
Michael Cobb		4-6-18, 1800
Received By:		Date/Time:
Michael Cobb		4/9/18

AF72017-09 - issued 4/3/2017

1339 Motor Circle, Dallas, TX 75207 * (214) 920-5006, Fax 1-972-767-0167
NVLAP Code 200569-0, TDSHS-Asbestos 30-0287, TDSHS-Mold LAB1034, AZ Lab Cert AZ0948

3 of 4



CL Project No. PLM-16721
(Lab Only) SAT-24904

Project Name SOE Warehouse

Project No. EA187023

AF72017-09 - issued 4/3/2017

1339 Motor Circle, Dallas, TX 75207 * (214) 920-5006, Fax 1-972-767-0167

NVLAP Code 200569-0 TDSHS-Asbestos 30-0287 TDSHS-Mold LAB1034 AZ Lab Cert AZ0948

4 of 4

PLM REPORT SUMMARY



Cates Laboratories

1339 Motor Circle
Dallas, Texas 75207 (214) 920-5006

NVLAP Lab No. 200569-0
TDSHS License No. 30-0287

Client: Terracon	Lab Job No.: PLM-16721
Project: SOE Warehouse; 3201 W. Navy Blvd	Set No.: 24904
Project No: EA187023	Report Date: 4/12/2018
Identification: Asbestos, Bulk Sample Analysis	Sample Date: 4/5/2018
Test Method: Polarized Light Microscopy/Dispersion Staining (PLM/DS) EPA Method 600/R-93/116	Page 1 of 8

On 4/9/2018, eighty (80) bulk samples were submitted by Mr. Michael Cobb of Terracon for asbestos analysis by PLM/DS. Copies of the lab data sheets are attached; additional information may be found therein. The results are summarized below:

Lab Sample No.	Client Field I.D.	Sample Description/Location	Asbestos Content
CL609484	SOE-1A	9" X 9" Light Brown Ceramic Tile/Grout - Sales Floor	None Detected - Ceramic Tile None Detected - Grout None Detected - Thinset
CL609485	SOE-1B	9" X 9" Light Brown Ceramic Tile/Grout - Office Hallway 1st Floor	None Detected - Ceramic Tile None Detected - Grout None Detected - Thinset
CL609486	SOE-1C	9" X 9" Light Brown Ceramic Tile/Grout - Bathroom Hallway	None Detected - Ceramic Tile None Detected - Grout None Detected - Thinset
CL609487	SOE-2A	Brown Wood Pattern Peel/Stick Flooring - Office #2	None Detected - Floor Tile None Detected - Clear Adhesive
CL609488	SOE-2B	Brown Wood Pattern Peel/Stick Flooring - Office #4	None Detected - Floor Tile None Detected - Clear Adhesive
CL609489	SOE-2C	Brown Wood Pattern Peel/Stick Flooring - Lounge behind Chapel	None Detected - Floor Tile None Detected - Clear Adhesive
CL609490	SOE-3A	14" X 14" Beige Ceramic Floor Tile - Women's Restroom, 1st Floor	None Detected - Ceramic Tile None Detected - Grout None Detected - Thinset
CL609491	SOE-3B	14" X 14" Beige Ceramic Floor Tile - Women's Restroom, 1st Floor	None Detected - Ceramic Tile None Detected - Grout None Detected - Thinset
CL609492	SOE-3C	14" X 14" Beige Ceramic Floor Tile - Women's Restroom, 1st Floor	None Detected - Ceramic Tile None Detected - Grout None Detected - Thinset
CL609493	SOE-4A	Black Interior Caulking - Storefront, Northwest Corner	None Detected
CL609494	SOE-4B	Black Interior Caulking - Storefront, Northeast Corner	None Detected
CL609495	SOE-4C	Black Interior Caulking - Storefront, Central Area	None Detected
CL609496	SOE-5A	Gray & White Wallpaper - Office #1	None Detected

These samples were analyzed by layers. The overall percent asbestos for the sample is reported when relevant. The EPA considers a material to be asbestos containing only if it contains greater than one percent asbestos by Calibrated Visual Area Estimation (CVAE). EPA regulations also indicate that Regulated Asbestos Containing Materials (RACM) – materials that are friable or may become friable – be further analyzed by point counting when the results indicate less than ten percent asbestos by CVAE. CatesLab utilizes CVAE on a routine basis and does not include point counting unless specifically requested by the client. The results may not be reproduced except in full.

PLM REPORT SUMMARY



Cates Laboratories

1339 Motor Circle
Dallas, Texas 75207 (214) 920-5006

NVLAP Lab No. 200569-0
TDSHS License No. 30-0287

Client: Terracon	Lab Job No.: PLM-16721
Project: SOE Warehouse; 3201 W. Navy Blvd	Set No.: 24904
Project No: EA187023	Report Date: 4/12/2018
Identification: Asbestos, Bulk Sample Analysis	Sample Date: 4/5/2018
Test Method: Polarized Light Microscopy/Dispersion Staining (PLM/DS) EPA Method 600/R-93/116	Page 2 of 8

On 4/9/2018, eighty (80) bulk samples were submitted by Mr. Michael Cobb of Terracon for asbestos analysis by PLM/DS. Copies of the lab data sheets are attached; additional information may be found therein. The results are summarized below:

Lab Sample No.	Client Field I.D.	Sample Description/Location	Asbestos Content
CL609497	SOE-5B	Gray & White Wallpaper - Office #10	None Detected
CL609498	SOE-5C	Gray & White Wallpaper - 1st Floor Restroom Hallway	None Detected
CL609499	SOE-6A	Yellow Carpet Mastic - Office #6	None Detected
CL609500	SOE-6B	Yellow Carpet Mastic - Office #7	None Detected
CL609501	SOE-6C	Yellow Carpet Mastic - 2nd Floor Hallway by Break Room	None Detected
CL609502	SOE-7A	Green Carpet Mastic - Former Daycare Room	None Detected
CL609503	SOE-7B	Green Carpet Mastic - Former Daycare Room	None Detected
CL609504	SOE-7C	Green Carpet Mastic - Former Daycare Room	None Detected
CL609505	SOE-8A	12" X 12" Gray & White Floor Tile - Former Daycare Room	None Detected - Yellow Mastic None Detected - Floor Tile None Detected - Yellow Mastic
CL609506	SOE-8B	12" X 12" Gray & White Floor Tile - Former Daycare Room	None Detected - Yellow Mastic None Detected - Floor Tile None Detected - Yellow Mastic
CL609507	SOE-8C	12" X 12" Gray & White Floor Tile - Former Daycare Room	None Detected - Yellow Mastic None Detected - Floor Tile None Detected - Yellow Mastic
CL609508	SOE-9A	Smooth Wallboard Ceiling - Women's Restroom, 1st Floor	None Detected - Paint Layer None Detected - Paper None Detected - Wallboard Material
CL609509	SOE-9B	Smooth Wallboard Ceiling - Southeast Storage Room	None Detected - Paint Layer None Detected - Paper None Detected - Wallboard Material
CL609510	SOE-9C	Smooth Wallboard Ceiling - Southeast Storage Room	None Detected - Paint Layer None Detected - Joint Compound None Detected - Paper None Detected - Wallboard Material

These samples were analyzed by layers. The overall percent asbestos for the sample is reported when relevant. The EPA considers a material to be asbestos containing only if it contains greater than one percent asbestos by Calibrated Visual Area Estimation (CVAE). EPA regulations also indicate that Regulated Asbestos Containing Materials (RACM) – materials that are friable or may become friable – be further analyzed by point counting when the results indicate less than ten percent asbestos by CVAE. CatesLab utilizes CVAE on a routine basis and does not include point counting unless specifically requested by the client. The results may not be reproduced except in full.

PLM REPORT SUMMARY



Cates Laboratories

1339 Motor Circle
Dallas, Texas 75207 (214) 920-5006

NVLAP Lab No. 200569-0
TDSHS License No. 30-0287

Client: Terracon	Lab Job No.: PLM-16721
Project: SOE Warehouse; 3201 W. Navy Blvd	Set No.: 24904
Project No: EA187023	Report Date: 4/12/2018
Identification: Asbestos, Bulk Sample Analysis	Sample Date: 4/5/2018
Test Method: Polarized Light Microscopy/Dispersion Staining (PLM/DS) EPA Method 600/R-93/116	Page 3 of 8

On 4/9/2018, eighty (80) bulk samples were submitted by Mr. Michael Cobb of Terracon for asbestos analysis by PLM/DS. Copies of the lab data sheets are attached; additional information may be found therein. The results are summarized below:

Lab Sample No.	Client Field I.D.	Sample Description/Location	Asbestos Content
CL609511	SOE-10A	Textured Wallboard on Walls - Women's Restroom, 1st Floor	None Detected - Paint Texture None Detected - Joint Tape None Detected - Joint Compound None Detected - Paper None Detected - Wallboard Material
CL609512	SOE-10B	Textured Wallboard on Walls - 1st Floor, Restroom Hall	None Detected - Paint Texture None Detected - Joint Compound None Detected - Paper None Detected - Wallboard Material
CL609513	SOE-10C	Textured Wallboard on Walls - Chapel	None Detected - Paint Texture None Detected - Joint Tape None Detected - Joint Compound None Detected - Paper None Detected - Wallboard Material
CL609514	SOE-10D	Textured Wallboard on Walls - Chapel	None Detected - Paint Texture None Detected - Joint Tape None Detected - Joint Compound None Detected - Paper None Detected - Wallboard Material
CL609515	SOE-10E	Textured Wallboard on Walls - Chapel	None Detected - Paint Texture None Detected - Joint Tape None Detected - Joint Compound None Detected - Paper None Detected - Wallboard Material
CL609516	SOE-11A	Black Mastic on Plywood - Office #13	None Detected
CL609517	SOE-11B	Black Mastic on Plywood - Office #13	None Detected
CL609518	SOE-11C	Black Mastic on Plywood - Office #13	None Detected
CL609519	SOE-12A	Non-Textured Wallboard - 1st Floor, Women's Restroom Storage	None Detected - Paint Layer None Detected - Joint Tape None Detected - Joint Compound None Detected - Paper None Detected - Wallboard Material

These samples were analyzed by layers. The overall percent asbestos for the sample is reported when relevant. The EPA considers a material to be asbestos containing only if it contains greater than one percent asbestos by Calibrated Visual Area Estimation (CVAE). EPA regulations also indicate that Regulated Asbestos Containing Materials (RACM) – materials that are friable or may become friable – be further analyzed by point counting when the results indicate less than ten percent asbestos by CVAE. CatesLab utilizes CVAE on a routine basis and does not include point counting unless specifically requested by the client. The results may not be reproduced except in full.

PLM REPORT SUMMARY



Cates Laboratories

1339 Motor Circle
Dallas, Texas 75207 (214) 920-5006

NVLAP Lab No. 200569-0
TDSHS License No. 30-0287

Client: Terracon	Lab Job No.: PLM-16721
Project: SOE Warehouse; 3201 W. Navy Blvd	Set No.: 24904
Project No: EA187023	Report Date: 4/12/2018
Identification: Asbestos, Bulk Sample Analysis	Sample Date: 4/5/2018
Test Method: Polarized Light Microscopy/Dispersion Staining (PLM/DS) EPA Method 600/R-93/116	

Page 4 of 8

On 4/9/2018, eighty (80) bulk samples were submitted by Mr. Michael Cobb of Terracon for asbestos analysis by PLM/DS. Copies of the lab data sheets are attached; additional information may be found therein. The results are summarized below:

Lab Sample No.	Client Field I.D.	Sample Description/Location	Asbestos Content
CL609520	SOE-12B	Non-Textured Wallboard - Office #13	None Detected - Paint Layer None Detected - Joint Compound None Detected - Paper None Detected - Wallboard Material
CL609521	SOE-12C	Non-Textured Wallboard - Office #10, Restroom	None Detected - Paint Layer None Detected - Joint Tape None Detected - Joint Compound None Detected - Paper None Detected - Wallboard Material
CL609522	SOE-13A	Brown, Gray & White 12" X 12" Floor Tile - Office #10, Restroom	None Detected - Floor Tile None Detected - Yellow Mastic
CL609523	SOE-13B	Brown, Gray & White 12" X 12" Floor Tile - Men's Restroom, 2nd Floor	None Detected - Floor Tile None Detected - Yellow Mastic
CL609524	SOE-13C	Brown, Gray & White 12" X 12" Floor Tile - Women's Restroom, 2nd Floor	None Detected - Floor Tile None Detected - Yellow Mastic
CL609525	SOE-14A	4" Brown Cove Base w/Yellow Mastic - Office #10, Restroom	None Detected - Cove Base None Detected - Yellow Mastic
CL609526	SOE-14B	4" Brown Cove Base w/Yellow Mastic - Women's Restroom, 2nd Floor	None Detected - Cove Base None Detected - Yellow Mastic
CL609527	SOE-14C	4" Brown Cove Base w/Yellow Mastic - Chapel	None Detected - Cove Base None Detected - Yellow Mastic
CL609528	SOE-15A	CMU w/Mortar - Storage adjacent to Break Room	None Detected - Paint Layer None Detected - CMU Block None Detected - Mortar
CL609529	SOE-15B	CMU w/Mortar - Chapel, North Wall	None Detected - Filler/Texture None Detected - CMU Block None Detected - Mortar
CL609530	SOE-15C	CMU w/Mortar - Lounge behind Chapel	None Detected - Filler/Texture None Detected - CMU Block None Detected - Mortar

These samples were analyzed by layers. The overall percent asbestos for the sample is reported when relevant. The EPA considers a material to be asbestos containing only if it contains greater than one percent asbestos by Calibrated Visual Area Estimation (CVAE). EPA regulations also indicate that Regulated Asbestos Containing Materials (RACM) – materials that are friable or may become friable – be further analyzed by point counting when the results indicate less than ten percent asbestos by CVAE. CatesLab utilizes CVAE on a routine basis and does not include point counting unless specifically requested by the client. The results may not be reproduced except in full.

PLM REPORT SUMMARY



Cates Laboratories

1339 Motor Circle
Dallas, Texas 75207 (214) 920-5006

NVLAP Lab No. 200569-0
TDSHS License No. 30-0287

Client: Terracon	Lab Job No.: PLM-16721
Project: SOE Warehouse; 3201 W. Navy Blvd	Set No.: 24904
Project No: EA187023	Report Date: 4/12/2018
Identification: Asbestos, Bulk Sample Analysis	Sample Date: 4/5/2018
Test Method: Polarized Light Microscopy/Dispersion Staining (PLM/DS) EPA Method 600/R-93/116	Page 5 of 8

On 4/9/2018, eighty (80) bulk samples were submitted by Mr. Michael Cobb of Terracon for asbestos analysis by PLM/DS. Copies of the lab data sheets are attached; additional information may be found therein. The results are summarized below:

Lab Sample No.	Client Field I.D.	Sample Description/Location	Asbestos Content
CL609531	SOE-16A	White HVAC Duct Mastic - HVAC Room, 2nd Floor	None Detected - White Mastic None Detected - Wrap None Detected - Insulation
CL609532	SOE-16B	White HVAC Duct Mastic - HVAC Room, 2nd Floor	None Detected - White Mastic None Detected - Wrap None Detected - Insulation
CL609533	SOE-16C	White HVAC Duct Mastic - HVAC Room, 2nd Floor	None Detected - White Mastic None Detected - Wrap None Detected - Insulation
CL609534	SOE-17A	Gray HVAC Duct Mastic - HVAC Room, 2nd Floor	None Detected
CL609535	SOE-17B	Gray HVAC Duct Mastic - HVAC Room, 2nd Floor	None Detected
CL609536	SOE-17C	Gray HVAC Duct Mastic - HVAC Room, 2nd Floor	None Detected
CL609537	SOE-18A	Black HVAC Duct Mastic - HVAC Room, 2nd Floor	None Detected
CL609538	SOE-19A	Paper Backing on Yellow Ceiling Insulation	None Detected - Wrap/Mastic None Detected - Insulation
CL609539	SOE-19B	Paper Backing on Yellow Ceiling Insulation	None Detected - Wrap/Mastic None Detected - Insulation
CL609540	SOE-19C	Paper Backing on Yellow Ceiling Insulation	None Detected - Wrap/Mastic None Detected - Insulation
CL609541	SOE-20A	Floor Filler - Chapel Entry, West	None Detected
CL609542	SOE-20B	Floor Filler - Chapel Entry, West	None Detected
CL609543	SOE-20C	Floor Filler - Chapel Entry, East	None Detected
CL609544	SOE-21A	Building Slab - Northwest Corner of Building	None Detected - Concrete
CL609545	SOE-21B	Building Slab - Chapel Custodial Closet	None Detected - Paint Layer None Detected - Concrete
CL609546	SOE-21C	Building Slab - Storage behind Chapel	None Detected - Concrete

These samples were analyzed by layers. The overall percent asbestos for the sample is reported when relevant. The EPA considers a material to be asbestos containing only if it contains greater than one percent asbestos by Calibrated Visual Area Estimation (CVAE). EPA regulations also indicate that Regulated Asbestos Containing Materials (RACM) – materials that are friable or may become friable – be further analyzed by point counting when the results indicate less than ten percent asbestos by CVAE. CatesLab utilizes CVAE on a routine basis and does not include point counting unless specifically requested by the client. The results may not be reproduced except in full.

PLM REPORT SUMMARY



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1339 Motor Circle
Dallas, Texas 75207 (214) 920-5006

NVLAP Lab No. 200569-0
TDSHS License No. 30-0287

Client: Terracon	Lab Job No.: PLM-16721
Project: SOE Warehouse; 3201 W. Navy Blvd	Set No.: 24904
Project No: EA187023	Report Date: 4/12/2018
Identification: Asbestos, Bulk Sample Analysis	Sample Date: 4/5/2018
Test Method: Polarized Light Microscopy/Dispersion Staining (PLM/DS) EPA Method 600/R-93/116	Page 6 of 8

On 4/9/2018, eighty (80) bulk samples were submitted by Mr. Michael Cobb of Terracon for asbestos analysis by PLM/DS. Copies of the lab data sheets are attached; additional information may be found therein. The results are summarized below:

Lab Sample No.	Client Field I.D.	Sample Description/Location	Asbestos Content
CL609547	SOE-22A	Brown Exterior Caulking - Hall Bath Entry	None Detected
CL609548	SOE-22B	Brown Exterior Caulking - Office #9, Window	None Detected
CL609549	SOE-22C	Brown Exterior Caulking - East Office Hall Entry	None Detected
CL609550	SOE-23A	12" X 12" Marble & Grout - Chapel Entry, East	None Detected - Marble Tile None Detected - Grout None Detected - Thinset
CL609551	SOE-23B	12" X 12" Marble & Grout - Chapel Entry, West	None Detected - Marble Tile None Detected - Grout None Detected - Thinset
CL609552	SOE-24A	Unfinished Drywall - Break Room, West Wall	None Detected - Joint Tape None Detected - Joint Compound None Detected - Paper None Detected - Wallboard Material
CL609553	SOE-24B	Unfinished Drywall - Break Room, East Wall	None Detected - Joint Compound None Detected - Paper None Detected - Wallboard Material
CL609554	SOE-24C	Unfinished Drywall - Storage Room by Break Room	None Detected - Joint Compound None Detected - Paper None Detected - Wallboard Material
CL609555	SOE-25A	Concrete Columns - Awning	None Detected - Paint Layer None Detected - Concrete
CL609556	SOE-25B	Concrete Columns - Awning	None Detected - Paint Layer None Detected - Concrete
CL609557	SOE-25C	Concrete Columns - Awning	None Detected - Paint Layer None Detected - Concrete
CL609558	SOE-26A	Felt Paper w/Concrete Columns	None Detected
CL609559	SOE-26B	Felt Paper w/Concrete Columns	None Detected
CL609560	SOE-26C	Felt Paper w/Concrete Columns	None Detected

These samples were analyzed by layers. The overall percent asbestos for the sample is reported when relevant. The EPA considers a material to be asbestos containing only if it contains greater than one percent asbestos by Calibrated Visual Area Estimation (CVAE). EPA regulations also indicate that Regulated Asbestos Containing Materials (RACM) – materials that are friable or may become friable – be further analyzed by point counting when the results indicate less than ten percent asbestos by CVAE. CatesLab utilizes CVAE on a routine basis and does not include point counting unless specifically requested by the client. The results may not be reproduced except in full.

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NVLAP Lab No. 200569-0
TDSHS License No. 30-0287

Client:	Terracon	Lab Job No.:	PLM-16721
Project:	SOE Warehouse; 3201 W. Navy Blvd	Set No.:	24904
Project No:	EA187023	Report Date:	4/12/2018
Identification:	Asbestos, Bulk Sample Analysis	Sample Date:	4/5/2018
Test Method:	Polarized Light Microscopy/Dispersion Staining (PLM/DS) EPA Method 600/R-93/116		

Page 7 of 8

On 4/9/2018, eighty (80) bulk samples were submitted by Mr. Michael Cobb of Terracon for asbestos analysis by PLM/DS. Copies of the lab data sheets are attached; additional information may be found therein. The results are summarized below:

Lab Sample No.	Client Field I.D.	Sample Description/Location	Asbestos Content
CL609561	SOE-27A	White Caulking - on Lower Roof Level	None Detected
CL609562	SOE-27B	White Caulking - on Lower Roof Level	None Detected
CL609563	SOE-27C	White Caulking - on Lower Roof Level	None Detected

These samples were analyzed by layers. The overall percent asbestos for the sample is reported when relevant. The EPA considers a material to be asbestos containing only if it contains greater than one percent asbestos by Calibrated Visual Area Estimation (CVAE). EPA regulations also indicate that Regulated Asbestos Containing Materials (RACM) – materials that are friable or may become friable – be further analyzed by point counting when the results indicate less than ten percent asbestos by CVAE. CatesLab utilizes CVAE on a routine basis and does not include point counting unless specifically requested by the client. The results may not be reproduced except in full.

PLM REPORT SUMMARY



Cates Laboratories

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Dallas, Texas 75207 (214) 920-5006

NVLAP Lab No. 200569-0
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Client: Terracon
Project: SOE Warehouse; 3201 W. Navy Blvd
Project No: EA187023
Identification: Asbestos, Bulk Sample Analysis
Test Method: Polarized Light Microscopy/Dispersion Staining (PLM/DS)
EPA Method 600/R-93/116

Lab Job No.: PLM-16721
Set No.: 24904
Report Date: 4/12/2018
Sample Date: 4/5/2018

Page 8 of 8

On 4/9/2018, eighty (80) bulk samples were submitted by Mr. Michael Cobb of Terracon for asbestos analysis by PLM/DS. Copies of the lab data sheets are attached; additional information may be found therein.

STATEMENT OF LABORATORY ACCREDITATION

The samples were analyzed in general accordance with the procedures outlined in the Method for the Determination of Asbestos in Bulk Building Materials, EPA/600/R-93/116 or the U.S. Environmental Protection Agency method, under AHERA (EPA 600/M4-82-020), for the analysis of asbestos in building materials by polarized light microscopy. The results of each bulk sample relate only to the material tested and the results shall not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Specific questions concerning bulk sample results shall be directed to the Laboratory Director.

Analyst: Chris Munch

Laboratory Director: John R. Cates, P.G.

Approved Signatory:



NVLAP LAB CODE 200569-0

APPENDIX D

LEAD ANALYTICAL LABORATORY DATA

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Lead (Pb) Chain of Custody

EMSL Order ID (Lab Use Only):

PHONE: ()

FAX: ()

201803616

Company: Terracon		EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different If Bill to is Different note instructions in Comments**	
Street: 9900 N. Davis Highway		Third Party Billing requires written authorization from third party	
City: Pensacola	State/Province: FL	Zip/Postal Code:	Country:
Report To (Name): Michael Cobb		Telephone #:	
Email Address: michael.cobb@terracon.com		Fax #:	Purchase Order:
Project Name/Number: EA187023		Please Provide Results: <input type="checkbox"/> Fax <input type="checkbox"/> Email	
U.S. State Samples Taken: FL		CT Samples: <input type="checkbox"/> Commercial/Taxable <input type="checkbox"/> Residential/Tax Exempt	
Turnaround Time (TAT) Options* - Please Check			
<input type="checkbox"/> 3 Hour <input type="checkbox"/> 6 Hour <input type="checkbox"/> 24 Hour <input type="checkbox"/> 48 Hour <input type="checkbox"/> 72 Hour <input checked="" type="checkbox"/> 96 Hour <input type="checkbox"/> 1 Week <input type="checkbox"/> 2 Week			
*Analysis completed in accordance with EMSL's Terms and Conditions located in the Price Guide			
Matrix	Method	Instrument	Reporting Limit
Chips <input checked="" type="checkbox"/> % by wt. <input type="checkbox"/> mg/cm ² <input type="checkbox"/> ppm (mg/kg)	SW846-7000B	Flame Atomic Absorption	0.01%
Air	NIOSH 7082	Flame Atomic Absorption	4 µg/filter
	NIOSH 7105	Graphite Furnace AA	0.03 µg/filter
	NIOSH 7300M/NIOSH 7303	ICP-OES	0.5 µg/filter
Wipe* <input type="checkbox"/> ASTM <input type="checkbox"/> non ASTM <input type="checkbox"/>	SW846-7000B	Flame Atomic Absorption	10 µg/wipe
*if no box checked, non-ASTM Wipe assumed	SW846-6010B or C	ICP-OES	1.0 µg/wipe
TCLP	SW846-1311/7000B/SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)
	SW846-1311/SW846-6010B or C	ICP-OES	0.1 mg/L (ppm)
SPLP	SW846-1312/7000B/SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)
	SW846-1312/SW846-6010B or C	ICP-OES	0.1 mg/L (ppm)
TTLC	22 CCR App. II, 7000B/7420	Flame Atomic Absorption	40 mg/kg (ppm)
	22 CCR App. II, SW846-6010B or C	ICP-OES	2 mg/kg (ppm)
STLC	22 CCR App. II, 7000B/7420	Flame Atomic Absorption	0.4 mg/L (ppm)
	22 CCR App. II, SW846-6010B or C	ICP-OES	0.1 mg/L (ppm)
Soil	SW846-7000B	Flame Atomic Absorption	40 mg/kg (ppm)
	SW846-6010B or C	ICP-OES	2 mg/kg (ppm)
Wastewater Unpreserved <input type="checkbox"/>	SM3111B/SW846-7000B	Flame Atomic Absorption	0.4 mg/L (ppm)
Preserved with HNO ₃ pH < 2 <input type="checkbox"/>	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)
	EPA 200.7	ICP-OES	0.020 mg/L (ppm)
Drinking Water Unpreserved <input type="checkbox"/>	EPA 200.8	ICP-MS	0.001 mg/L (ppm)
Preserved with HNO ₃ pH < 2 <input type="checkbox"/>	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)
	EPA 200.5	ICP-OES	0.003 mg/L (ppm)
TSP/SPM Filter	40 CFR Part 50	ICP-OES	12 µg/filter
	40 CFR Part 50	Graphite Furnace AA	3.6 µg/filter
Other:			
Name of Sampler: Michael Cobb		Signature of Sampler: <i>Michael Cobb</i>	
Sample #	Location	Volume/Area	Date/Time Sampled
1- SOE-P1	Door Frames	Gray Paint	4/5/18
2- SOE-P2	Wood Paneling	Light Gray Paint	4/5/18
Client Sample #s	SOE-P1 to SOE-P14		Total # of Samples: 14
Relinquished (Client): Terracon	Date: 4-6-18	Time: 1800	
Received (Lab): <i>Celestina</i>	Date: 4/9/18	Time: 1015	<i>faxed</i>
Comments:	<i>APU</i>		



EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

LEAD (Pb) CHAIN OF CUSTODY
EMSL ORDER ID (Lab Use Only):

PHONE: ()
FAX: ()

201803616

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Location	Volume/Area	Date/Time Sampled
3- SOE-P3	Baseboards, Doors, and Door Frames	Stain	4/5/18
4- SOE-P4	Door Frames, Doors, and Baseboards	Greenish Gray	4/5/18
5- SOE-P5	Door Frames	White	4/5/18
6- SOE-P6	Baseboards	Baby Blue	4/5/18
7- SOE-P7	Wood Paneling	Light Blue	4/5/18
8- SOE-P8	CMU Walls	White with Blue Undercoat	4/5/18
9- SOE-P9	Metal Doors	Beige with Blue Undercoat	4/5/18
10- SOE-P10	Wallboard	Off-White	4/5/18
11- SOE-P11	Metal Trusses	Reddish Brown	4/5/18
12- SOE-P12	Concrete Slab	Purple	4/5/18
13- SOE-P13	Metal Bay Door Framing	Brown	4/5/18
14- SOE-P14	Mezzanine behind Chapel	White	4/5/18
Comments/Special Instructions:			

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone/Fax: (856) 303-2500 / (856) 786-5974

<http://www.EMSL.com>cinnaminsonleadlab@emsl.com

EMSL Order: 201803616
CustomerID: TRFL42
CustomerPO: EA187023
ProjectID:

Attn: **Michael Cobb**
Terracon, Inc
9900 North Davis Highway
Pensacola, FL 32514

Phone: (850) 477-0454
Fax:
Received: 04/09/18 10:15 AM
Collected: 4/5/2018

Project: **EA187023****Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)***

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Weight</i>	<i>Lead Concentration</i>
SOE-P1 Site: Door Frames / Gray Paint	201803616-0001	4/5/2018	4/12/2018	0.2541 g	<0.0080 % wt
SOE-P2 Site: Wood Paneling / Light Gray Paint	201803616-0002	4/5/2018	4/12/2018	0.2505 g	<0.0080 % wt
SOE-P3 Site: Baseboards, Doors, and Door Frames / Stain	201803616-0003	4/5/2018	4/12/2018	0.2084 g	<0.0096 % wt
SOE-P4 Site: Door Frames, Doors and Baseboards / Greenish Gray	201803616-0004	4/5/2018	4/12/2018	0.2520 g	<0.0080 % wt
SOE-P5 Site: Door Frames / White	201803616-0005	4/5/2018	4/12/2018	0.2517 g	<0.0080 % wt
SOE-P6 Site: Baseboards / Baby Blue	201803616-0006	4/5/2018	4/12/2018	0.2536 g	<0.0080 % wt
SOE-P7 Site: Wood Paneling / Light Blue	201803616-0007	4/5/2018	4/12/2018	0.2594 g	<0.0080 % wt
SOE-P8 Site: CMU Walls / White with Blue Undercoat	201803616-0008	4/5/2018	4/12/2018	0.2520 g	<0.0080 % wt
SOE-P9 Site: Metal Doors / Beige with Blue Undercoat	201803616-0009	4/5/2018	4/12/2018	0.2582 g	<0.0080 % wt
SOE-P10 Site: Wallboard / Off-White	201803616-0010	4/5/2018	4/12/2018	0.2591 g	<0.0080 % wt
SOE-P11 Site: Metal Trusses / Reddish Brown	201803616-0011	4/5/2018	4/12/2018	0.2523 g	0.069 % wt
SOE-P12 Site: Concrete Slab / Purple	201803616-0012	4/5/2018	4/13/2018	0.2592 g	<0.0080 % wt
SOE-P13 Site: Metal Bay Door Framing / Brown	201803616-0013	4/5/2018	4/13/2018	0.2502 g	<0.0080 % wt
SOE-P14 Site: Mezzanine behind Chapel / White	201803616-0014	4/5/2018	4/13/2018	0.2523 g	<0.0080 % wt

Phillip Worby, Lead Laboratory Manager
or other approved signatory

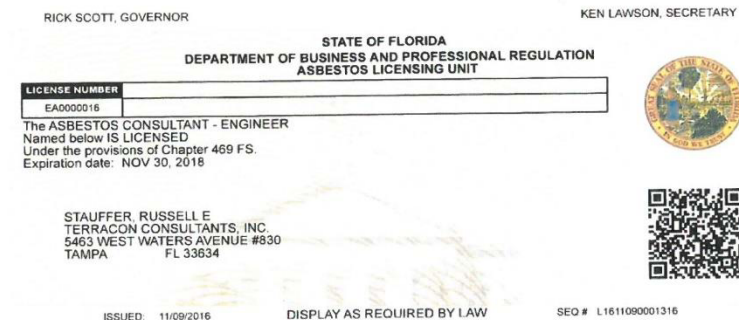
*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.008 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NELAP Certifications: NJ 03036, NY 10872, PA 68-00367, AIHA-LAP, LLC ELLAP 100194, A2LA 2845.01

Initial report from 04/13/2018 13:42:07

APPENDIX E

CERTIFICATIONS AND LICENSES



SECTION 011000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Project consists of the renovation of a warehouse.
 - 1. Project Location: 3201 Navy Boulevard, Pensacola, Florida.
 - 2. Owner: Escambia County, Florida
- B. Architect Identification: The Contract Documents, dated January 11, 2019, were prepared for the project by TOWNES + architects, P.A., 2421 N. 12th. Ave, Pensacola, Florida.
- C. The Work consists of interior and exterior renovations of the existing facility.
- D. Project will be constructed under the standard Escambia County general construction contract, included herein by reference.

1.2 USE OF PREMISES

- A. General: The existing building will generally be unoccupied during the renovation of the facility. Contractor shall have limited use of premises for construction operations, including use of Project site, during construction period. Contractor shall cooperate with the Owner and Staff to maintain the facility in a fully functional manner, including all fire protection and life safety systems. Contractor's use of premises is limited by Owner's right to perform work or to retain other contractors on portions of Project.

1.3 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 6 a.m. to 6 p.m., Monday through Friday, unless otherwise indicated.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than 10 days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.4 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

1.5 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 011400 - WORK RESTRICTIONS

PART 1 - GENERAL

1.1 USE OF PREMISES

- A. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.
 - 1. Limits: Confine constructions operations to the areas indicated on the documents. A lay down area will be provided to the contractor.
 - 2. Owner Occupancy: Allow for Owner occupancy of the remaining first floor and use Owner's personnel.
 - 3. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- B. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period. Provide fencing as required to keep public from entering the work area. Erect temporary one hour fire rated partitions and PVC dust containment barriers on the interior as indicated and required to prevent the public and staff from entering the work area and maintain dust control.

1.2 OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner will occupy site and existing building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations.
- B. Partial Owner Occupancy: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
 - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
 - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
 - 3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will provide, operate, and maintain mechanical and electrical systems serving occupied portions of building.
 - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011400

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.

1.2 SELECTION AND PURCHASE

1.3 INFORMATIONAL SUBMITTALS

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

1.4 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, delivery to Project site and installation by the Allowance subcontractor.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.5 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Lump-Sum Allowance: Include the sum of Forty Thousand, Nine Hundred and Fifty-Eight Dollars and Twenty Cents (\$40,958.20) for the engineering, installation and integration of the Security, Access Control, Security Cameras, and Intrusion System as indicated below and required for a complete installation.

1. Overview – Security Systems:

- a. The security sub-contractor shall provide and install a fully functioning security suite for the Supervisor of Elections Warehouse Building consisting of Access Control, Cameras, and Intrusion. Escambia County shall approve the sub-contractor for the security systems work. All systems shall be installed as per manufacturers specifications and as per the provided floor plans and project documents. All work shall be performed in a professional and workmanlike manner and shall adhere to the quality and safety standards as required by the specifications and the General Contracting Company.

2. Scope of Work- Access Control:
 - a. The Access Control system at the S.O.E. Warehouse shall integrate with the Lenel OnGuard access control system at Escambia County Supervisor of Elections.
 - b. All controllers, power supplies and peripheral devices (card readers, release buttons, etc.) will be current models that are pre-approved for use on Escambia County's Lenel Access Control System.
 - c. The security sub-contractor shall provide and install all wiring, raceway and conduit stub-ups as necessary.
 - d. The security sub-contractor shall program and setup all access levels and programming for the S.O.E. Warehouse as part of this scope. Once the system is programmed and commissioned...it will be turned over to Escambia County Facilities for card holder management and day to day operation.
 - e. Exclusions:
 - (1) 110V power to be provided for control panels and power supplies in the Comm Room
 - (2) Escambia County LAN connection (located in Comm Room)
 - (3) Electronic locks and locking mechanisms to be provided and installed by others as specified in Architectural Drawings.
 - (4) Security Engineering to provide all electric lock power supplies.
 - (5) Fire alarm door release relay to be provided by others
3. Scope of Work- Security Cameras
 - a. The Security Camera system at the S.O.E. Warehouse shall integrate with the existing Exacqvision camera system.
 - b. All cameras will be of manufacturer, model and specifications that are pre-approved by Escambia County Exacqvision Systems. All models to be of latest version.
 - c. All cameras to be installed as described in project documents and floor plans.
 - d. Exclusions:
 - (1) Category 6 cabling to be installed, terminated and tested by others
 - (2) Escambia County LAN connection (located in Comm Room)
4. Scope of Work- Intrusion
 - a. A DSC Neo Intrusion system will be installed at the S.O.E. Warehouse. The system will provide detection on all exterior doors with interior PIR motion detection strategically placed.
 - b. All Intrusion System controls and devices will be of manufacturer, model and specifications that are pre-approved for us by Escambia County
 - c. The intrusion system will be remotely monitored by a 24-hour central station via GSM communicator.
 - d. Arm/Disarm stations will include a Digital Arming Station and a Lenel reader so that the system can be armed/disarmed by badge swipe. Arming stations to be placed convenient to entry and exit of building.
 - e. Exclusions: None

5. Project Execution and Delivery
 - a. Upon acceptance, the security sub-contractor shall follow the construction schedule set forth by the General Contracting company and coordinate with associated contractors as necessary for installation.
6. Warranty
 - a. The security sub-contractor warranty all equipment and labor for a period of one (1) year from project completion and commissioning. After one (1) year, all equipment shall follow standard manufacturer's warranty.

END OF SECTION 012100

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

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

1.3 PROCEDURES

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

PART 2 - EXECUTION

2.1 SCHEDULE OF ALTERNATES

- A. Alternate No. One: Provide seal coating of existing parking lot. See Sheet A001 – Architectural Site Plan. Note that stripping is base bid.

END OF SECTION 012300

SECTION 012500 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 MINOR CHANGES IN THE WORK

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

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 5 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Use AIA Document G709.

1.4 ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 10 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 10 days after such authorization.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

1.5 CHANGE ORDER PROCEDURES

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

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

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1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Submittals Schedule and Application for Payment forms with Continuation Sheets.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than 10 days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.

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

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: The date for each progress payment is the 15th day of each month. The period covered by each Application for Payment starts on the day following the end of the preceding period and ends 15 days before the date for each progress payment.
- D. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- F. Transmittal: Submit 4 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar

attachments if required. Submission of Application for Payment may be electronic via email in .pdf format.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Submittals Schedule (preliminary if not final).
 5. List of Contractor's staff assignments.
 6. Copies of building permits.
 7. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 8. Certificates of insurance and insurance policies.
 9. Performance and payment bonds.
 10. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."

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6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General Project coordination procedures.
 - 2. Coordination Drawings.
 - 3. Project meetings.
- B. See Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 COORDINATION

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Preparation of the Schedule of Values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Pre-installation conferences.

7. Project closeout activities.

1.3 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 1. Indicate relationship of components shown on separate Shop Drawings.
 2. Indicate required installation sequences.
 3. See Division 15 Section "Basic Mechanical Materials and Methods" for specific Coordination Drawing requirements for mechanical installations.
 4. See Division 16 Section "Basic Electrical Materials and Methods" for specific Coordination Drawing requirements for electrical installations.

1.4 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at project site, unless otherwise indicated.
 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 5 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
 1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing.
 - d. Designation of responsible personnel.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for processing Applications for Payment.
 - g. Distribution of the Contract Documents.
 - h. Submittal procedures.
 - i. Preparation of Record Documents.
 - j. Use of the premises.
 - k. Responsibility for temporary facilities and controls.
 - l. Parking availability.

- m. Office, work, and storage areas.
 - n. Equipment deliveries and priorities.
 - o. First aid.
 - p. Security.
 - q. Progress cleaning.
 - r. Working hours.
- C. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
 - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related Change Orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Submittals.
 - g. Review of mockups.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written recommendations.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Required performance results.
 - u. Protection of construction and personnel.
 - 3. Record significant conference discussions, agreements, and disagreements.
 - 4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
 - 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
 - 14) Documentation of information for payment requests.
3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Submittals Schedule.
 - 3. Daily construction reports.
 - 4. Field condition reports.
 - 5. Construction photographs.
- B. See Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
- C. See Division 1 Section "Closeout Procedures" for submitting photographic negatives as Project Record Documents at Project closeout.

1.2 SUBMITTALS

- A. Submittals Schedule: Submit five copies of schedule. Submittals may be submitted electronically, via email, in a PDF format. Arrange the following information in a tabular format:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's final release or approval.
- B. Contractor's Construction Schedule: Submit five printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.
- C. Daily Construction Reports: Submit five copies at weekly intervals. Reports may be submitted electronically, via email, in a PDF format.
- A. Field Condition Reports: Submit 1 copy at time of discovery of differing conditions. Reports may be submitted electronically, via email, in a PDF format.

1.3 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
- C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, re-submittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 - 2. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for Notice to Proceed to date of Substantial and Final Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 2. Submittal Review Time: Include review and re-submittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 - 3. Startup and Testing Time: Include not less than 5 days for startup and testing.
 - 4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Work Restrictions: Show the effect on the schedule of the following:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Use of premises restrictions.
 - e. Provisions for future construction.
 - f. Seasonal variations.
 - g. Environmental control.
 5. Work Stages: Indicate important stages of construction for each major portion of the Work.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, time when Owner may begin equipment installation, Substantial Completion, and Final Completion.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.3 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording events at Project site, including the following:
1. List of subcontractors.
 2. High and low temperatures and general weather conditions.
 3. Accidents.
 4. Stoppages, delays, shortages, and losses.
 5. Meter readings and similar recordings.
 6. Orders and requests of authorities having jurisdiction.
 7. Services connected and disconnected.
 8. Equipment or system tests and startups.
- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule at each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- B. See Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
- C. See Division 1 Section "Closeout Procedures" for submitting warranties, Record Documents and O and M manuals.

1.2 DEFINITIONS

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

1.3 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- C. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect's receipt of submittal.
 - 1. Initial Review: Allow 5 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Allow 5 days for processing each re-submittal.
 4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- D. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Unique identifier, including revision number.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Other necessary identification.
- E. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
1. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals without review received from sources other than Contractor.
1. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
 - 1. Number of Copies: Submit 5 copies of each submittal, unless otherwise indicated. Architect will return 4 copies. Mark up and retain one returned copy as a Project Record Document. Submit one additional copy for work to be reviewed by engineers. Electronic submittals, via email, using PDF format is permitted. Distribution as required will be electronically.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Manufacturer's catalog cuts.
 - e. Wiring diagrams showing factory-installed wiring.
 - f. Printed performance curves.
 - g. Operational range diagrams.
 - h. Compliance with recognized trade association standards.
 - i. Compliance with recognized testing agency standards.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - 1. Preparation: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shop work manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Notation of coordination requirements.
 - j. Notation of dimensions established by field measurement.
 - 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
- D. Coordination Drawings: Comply with requirements in Division 1 Section "Project Management and Coordination."

- E. Samples: Prepare physical units of materials or products, including the following:
1. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
 2. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 3. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Submit two sets of Samples. Architect will retain one Sample sets; remainder will be returned.
 4. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side.
 5. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
 6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
- F. Product Schedule or List: Prepare a written summary indicating types of products required for the Work and their intended location.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
- B. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and

Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- J. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- K. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- L. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- M. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.
- N. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Closeout Procedures."
- O. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- P. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.
- Q. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections.

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

FURNISH AS SUBMITTED

FURNISH AS CORRECTED

REVISE AND RESUBMIT

- C. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. See Divisions 2 through 16 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.4 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.
- C. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Ambient conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

- A. 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.
- B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- D. 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.

- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.
- G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.
- H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect 3 days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.6 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
 - 2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
 - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
1. Testing agency will notify Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 5. Testing agency will retest and re-inspect corrected work.
- D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- E. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 5. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.

3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field-curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
 2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for selecting products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. See Division 1 Section "Closeout Procedures" for submitting warranties for contract closeout.
- C. See Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 DEFINITIONS

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

1.3 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 - 1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 - 2. Completed List: Within 5 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - 3. Architect's Action: Architect will respond in writing to Contractor within 3 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 5 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Acceptance: Change Order.
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

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

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
 - 3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

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

5. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
6. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
7. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Product" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
8. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
 - a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.
9. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect

for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.

2.3 COMPARABLE PRODUCTS

- A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
 1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01600

SECTION 017000 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SUBMITTALS

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.3 QUALITY ASSURANCE

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.

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

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than 2 days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.
- C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

3.4 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Anchors, Blocking and Fasteners: Provide anchors, blocking and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
- F. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- G. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Conform to Owner's Infection Control and Risk Assessment (ICRA) requirements. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 85 degrees, F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

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

3.6 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

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

END OF SECTION 017000

SECTION 017310 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. See Division 7 Section "Through-Penetration Firestop Systems" for patching fire-rated construction.
- C. See Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
- D. Requirements in this Section apply to mechanical and electrical installations. See Divisions 15 and 16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.2 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
- C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
 - 1. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.

1.3 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations. Flame cutting will be permitted upon obtaining a "Hot Work Permit" from the Owner.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. When flame cutting, maintain a fire watch a minimum of 4 hours after completion of flame cutting. All flame cutting shall be in strict accordance with Owner's Hot Work Permit. Provide adequate number of fully operational and charged fire extinguishers during flame cutting and fire watch period.
 - 3. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 4. Concrete and masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 5. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 - 6. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 7. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - 4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 017310

SECTION 017320 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes demolition and removal of the following:
 - 1. Selected portions of a building or structure.
 - 2. Selected site elements.
 - 3. Repair procedures for selective demolition operations.
- B. See Division 15 Sections for demolishing, cutting, patching, or relocating mechanical items.
- C. See Division 16 Sections for demolishing, cutting, patching, or relocating electrical items.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- D. Demolish: Detach items from existing construction and legally dispose of them off-site.

1.3 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 SUBMITTALS

- A. Proposed Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
 - 1. Dust control.
 - 2. Noise control.
- B. Schedule of Selective Demolition Activities: Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, interruption of utility services, use of elevator and stairs, and locations of temporary partitions and means of egress.

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

1.5 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.

1.6 PROJECT CONDITIONS

- A. Owner will not occupy portions of building immediately adjacent to selective demolition area except for limited storage of materials in the warehouse portion of the work. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 48 hours' notice to Owner of activities that will affect Owner's operations.
- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
 - 1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
 - 2. Erect and maintain required temporary one hour construction partitions as indicated on the drawings. Erect and maintain dust where indicated. Do not remove either until adequate separation of the construction area from the remaining facility can be established.
- C. Owner assumes no responsibility for condition of areas to be selectively demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If materials suspected of containing hazardous materials are encountered, do not disturb. Immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site will not be permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.2 UTILITY SERVICES

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
 - 1. Provide at least 48 hours' notice to Owner if shutdown of service is required during changeover.
- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.

2. If utility services are required to be removed, relocated, or abandoned, provide temporary utilities before proceeding with selective demolition that bypass area of selective demolition and that maintain continuity of service to other parts of building.
 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
- D. Utility Requirements: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
 2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
 3. Protect existing site improvements, appurtenances, and landscaping to remain.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- C. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide all temporary enclosures as required by infection control risk assessment.
- D. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
- E. Temporary Shoring: Provide and maintain shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.4 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
1. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.5 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations.
1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.
 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Obtain "Hot Work Permit" from Owner prior to flame cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations and a minimum of 4 hours after stopping flame cutting operations
 4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition, cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 PATCHING AND REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. Patching: Comply with Division 1 Section "Cutting and Patching."
- C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.
- D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.
- E. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
- F. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 017320

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Project Record Documents.
 - 3. Operation and maintenance manuals.
 - 4. Warranties.
 - 5. Instruction of Owner's personnel.
 - 6. Final cleaning.
- B. See Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
- C. See Division 1 Section "Construction Progress Documentation" for submitting Final Completion construction photographs and negatives.
- D. See Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.2 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.
 - 9. Submit test/adjust/balance records.
 - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 11. Advise Owner of changeover in heat and other utilities.

12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for field survey for Substantial Completion. On receipt of request, Architect will either proceed with field survey and/or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after survey and/or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Re-Survey: Request re-survey when the Work identified in previous surveys as incomplete is completed or corrected.
2. Results of completed survey will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
6. Submit final report of all independent third party testing agencies required by documents.

B. Survey: Submit a written request for final survey for acceptance. On receipt of request, Architect will either proceed with survey and/or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after survey and/or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Re-survey: Request re-survey when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit 3 copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1.5 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.
- B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
 - 1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
 - b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - 2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 - 3. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
 - 4. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
- C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Note related Change Orders and Record Drawings, where applicable.
- D. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- E. Project Photographs: Assemble project record photographs of all hidden and concealed conditions such as door and window anchorage, fire wall construction sequence, etc. for review and record by Florida Agency for Health Care Administration at the time of 100% Construction Survey.

1.6 OPERATION AND MAINTENANCE MANUALS

- A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data: Include emergency instructions and procedures, system and equipment descriptions, operating procedures, and sequence of operations.
 2. Maintenance Data: Include manufacturer's information, list of spare parts, maintenance procedures, maintenance and service schedules for preventive and routine maintenance, and copies of warranties and bonds.
- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.7 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive letter size paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
1. Provide instructors experienced in operation and maintenance procedures.

2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
3. Schedule training with Owner, through Architect, with at least 3 days' advance notice.
4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

3.2 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Sweep concrete floors broom-clean in unoccupied spaces.
 - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.
 - k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - l. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

- m. Replace parts subject to unusual operating conditions.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - q. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 023610 - TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following for termite control: Soil treatment.

1.3 DEFINITIONS

- A. EPA: Environmental Protection Agency.
- B. PCO: Pest control operator.

1.4 SUBMITTALS

- A. Product Data: Treatments and application instructions, including EPA-Registered Label.
- B. Product Certificates: Signed by manufacturers of termite control products certifying that treatments furnished comply with requirements.
- C. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following as applicable:
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Brand name and manufacturer of termiticide.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes, and rates of application used.
 - 6. Areas of application.
 - 7. Water source for application.
- D. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A PCO who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment in jurisdiction where Project is located and who is experienced and has completed termite control treatment similar to that indicated for this Project and whose work has a record of successful in-service performance.

- B. Regulatory Requirements: Formulate and apply termiticides, and label with a Federal registration number, to comply with EPA regulations and authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with EPA-Registered Label requirements and requirements of authorities having jurisdiction.

1.7 COORDINATION

- A. Coordinate soil treatment application with excavating, filling, and grading and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs, before construction.

1.8 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, signed by applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
- C. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

- A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in a soluble or emulsible, concentrated formulation that dilutes with water or foaming agent, and formulated to prevent termite infestation. Use only soil treatment solutions that are not harmful to plants.
Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AgrEvo Environmental Health, Inc.; a Company of Hoechst and Schering, Berlin.
 - 2. American Cyanamid Co.; Agricultural Products Group; Specialty Products Department.
 - 3. Bayer Corp.; Garden & Professional Care.

4. DowElanco.
5. FMC Corp.; Pest Control Specialties.
6. Zeneca Professional Products.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparing substrate. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended by termiticide manufacturer.
- C. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.
 1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers,

piers, and chimney bases; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.

3. Crawlspace: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
 4. Masonry: Treat voids.
 5. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
- B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
 - C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until round-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
 - D. Post warning signs in areas of application.
 - E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 023610

025100 - ASPHALT PAVEMENT SEALCOATING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Asphalt Pavement Sealcoating

1.2 REFERENCE STANDARDS

- A. American Society for Testing Materials (ASTM)
 - 1. D 2939-03 Standard Test Methods for Emulsified Bitumens Used as Protective Coatings
 - 2. The following ASTM test methods: D140, D466, D529, D244, C88, C131, C117, C127, C123, D1310, D2170, D95, D402, D2171, D5, D113, D2042, D711, D969, D1475, D3960, D2486, E70, D562, D3583, D3236, D5249, D6690, B117, D977
 - 3. MasterSeal Asphalt Pavement Sealer meets ASTM D8099/D8099M-17 Standard Specification for Asphalt Emulsion Pavement Sealer.
- B. South Coast Air Quality Management District
 - 1. SCAQMD Method 304 – Determination of Volatile Organic Compounds (VOC) In Various Materials.

1.3 SUBMITTALS

- A. Product Data
 - 1. Submit manufacturer's Product Data Sheet.

1.4 PROJECT/SITE CONDITIONS

- A. Ambient Conditions
 - 1. Both surface and ambient temperature must be a minimum of 50°F and rising before applying cold applied crack fillers, oil spot primers, pavement sealers or traffic paints (materials). Ambient and surface temperature shall not drop below 50°F for a 24 hour period following application of materials.
 - 2. Apply materials during dry conditions when rain is not imminent or forecast for at least 24 hours after application.
- B. Pavement/Surface Conditions
 - 1. Newly placed (paved) asphalt pavement surfaces should be allowed to cure a minimum of four (4) weeks under ideal weather conditions (70°F) before applying coatings.
 - 2. New pavement surfaces shall be free of residual oils or chemicals associated with the placement of new asphalt pavement.
 - 3. Aged pavement surfaces shall be cleaned and prepared as recommended in this specification under PART 3 Sections 3.1 thru 3.7 of this specification.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Subject to compliance with the specification, the Basis of Design is "SealMaster" Pavement Products and Equipment or Gem Seal Products or approved equal.

2.2 MATERIALS

- A. Provide the following products as required for a complete preparation and installation of the sealcoating, to be provided by a single source manufacturer's standard products:
 - A. Petro Seal Oil Spot Primer (Concentrate).
 - B. Prep Seal Oil Spot Primer (Ready-To-Use)
 - C. Crack Sealant (Cold-applied pourable crack sealant)
 - D. Parking Lot Grade (Hot Pour Rubberized Crack Sealant)
 - E. Trowel Grade Crack Filler
 - F. Asphalt Patching Material
 - G. Pothole Patch (Cold Patch)
 - H. Asphalt Binder Plus
 - I. Asphaltic Sealcoating material
 - J. Polymer Additive
 - K. Line Block-Out Paint (Black)

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine pavement surface prior to performing work
- B. Notify architect or project engineer of any adverse or unacceptable conditions that would affect successful repair efforts or application of materials
- C. Do not commence work until unacceptable conditions are corrected

3.2 SURFACE PREPARATION

- A. Surface must be clean and free from all loose material and dirt. Remove grass along edge of pavement to find true edge of pavement. Power blowers, mechanical sweeping devices and push brooms are acceptable cleaning methods.

3.3 CRACK REPAIR

- A. Cold Applied Crack Filling Materials and Methods
 - 1. Clean cracks of all dirt, debris and vegetation prior applying crack filling.
 - 2. For cracks up to 1/2" apply Crack Sealant. Sealant may be applied directly from container, pour pot, crack banding equipment or mechanized pumping equipment. Allow to dry before sealcoating.

3. For cracks larger than 1/2" wide and up to 1" wide apply trowel grade crack filler of patching material. Apply with trowel, squeegee or straightedge. Allow to dry before sealcoating.

3.4 ALLIGATORED PAVEMENT REPAIR

- A. Repair alligator cracks with pavement sealer.
 1. Remove all dirt, dust and vegetation on alligatored areas
 2. Apply sealer with trowel, squeegee or straightedge.
 3. Allow to dry before sealcoating.
 4. Contractor or other Entity Responsible for performing work shall refer to Manufacturer's Product Data Sheet for more detailed application instructions.

3.5 POTHOLE REPAIR

- A. Fill Potholes with pothole patch
 1. Remove loose material, debris and standing water from pothole prior to application.
 2. Apply pothole patch directly from bag into pothole
 3. Compact pothole patch with a hand tamper, vibratory-plate compactor or asphalt roller. Finished patchwork shall be flush and level with adjoining pavement.
 4. Contractor or other Entity Responsible for performing work shall refer to Manufacturer's Product Data Sheet for more detailed application instructions for pothole patch.

3.6 OIL SPOT PRIMING

- A. Prime Oil Spots with prep seal or petro seal
 1. Wipe or scrape excessive build-up of oil, grease, and gasoline spots. A torch may be used to burn away any residual.
 2. Apply oil spot primer with brush, roller or sprayer.
 3. Allow to dry before sealcoating.

3.7 LINE BLOCK-OUT PAINT

- A. Applying Line Block-Out Paint
 1. Remove all loose material and dirt from existing traffic markings.
 2. Apply Line Block-out paint with pressurized spray equipment, brush or roller.
 3. Allow to dry before sealcoating.

3.8 ASPHALT SEALCOAT APPLICATION

- A. Applying Sealcoat:
 1. Remove all loose material and dirt from pavement surface. Remove grass along edge of pavement to find true edge of pavement. Power blowers, mechanical sweeping devices and push brooms are acceptable cleaning methods.
 2. Equipment used to apply sealcoat shall have continuous agitation or mixing capabilities to maintain homogeneous consistency of pavement sealer mixture throughout the application process. Spray equipment shall be capable of mixing and spraying pavement sealer with

sand added. Self-propelled squeegee equipment with mixing capability shall have at least 2 squeegee or brush devices (one behind the other) to assure adequate distribution and penetration of sealer into pavement surface. Hand squeegees and brushes shall be acceptable in areas where practicality prohibits the use of mechanized equipment.

3. Sealcoat material shall be mixed in accordance with the following mix design (based on 100 gallons of sealcoat material for ease of calculation):
 - Sealcoat material..... 100 gallons
 - Water..... 15-25 gallons
 - Polymer additive..... 1 gallon
 - Sand (40 to 70 mesh AFS fineness gradation).....300-500 lbs.
4. Apply two coats of mixed sealcoat material at a rate of .11 to .13 gallon per square yard per coat to entire pavement area. Allow first coat to dry thoroughly before applying second coat.
5. Apply a third coat of mixed sealcoat material at a rate of .11 to .13 gallon per square yard to high traffic areas including parking area entrances, exits and drive lanes (or as specified in additional diagrams or drawings). Allow second coat to dry thoroughly before applying a third coat to these areas.
6. Allow final coat of pavement sealer to dry 24 hours prior to applying traffic paint.

END OF SECTION 025100

SECTION 025160 – PAVEMENT MARKINGS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Unless otherwise specified on the plan sheet or in other sections of this contract, all materials and work shall conform to the applicable requirements in the following documents:
 - 1. Florida Department of Transportation Roadway and Traffic Design Standards, Indices 17344 through 17359, latest edition.
 - 2. Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Sections 705, 706, 710, 971 and 993, latest edition.
 - 3. US DOT, Federal Highway Administration Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways, latest edition.
 - 4. Florida Building Code, Accessibility, 2017

1.2 SUMMARY

- A. The work under this section includes the installation of temporary and permanent pavement markings. The Contractor shall furnish all labor, materials, tools, supplies, equipment, and machinery necessary to fully complete the work shown on the plans and in these specifications.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. All materials shall be new and of good quality unless otherwise specified. The Contractor shall furnish samples and product data of materials and shall certify the materials meet all FDOT requirements. All material or work that has been rejected shall be remedied by the Contractor at his own expense and without delay. If the Contractor fails to promptly remove and dispose of rejected material and replace according to the specifications, the Owner may remove and replace the same and deduct the cost of the work from the contract amount.
- B. Permanent Pavement Markings shall meet all requirements of FDOT Specs, Section 710 or 711, latest edition.

PART 3 - EXECUTION**1.1 PAVEMENT MARKING**

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for a minimum of 14 days before starting pavement marking.

- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).
 - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils. Apply paint so that it cannot run beneath stencil.

END OF SECTION 025160

SECTION 028300 – CHAIN LINK FENCING & GATES**PART 1 - GENERAL****1.01 CONDITIONS AND REQUIREMENTS**

- A. The General conditions, Supplementary conditions, and Division 1 – General Requirements apply.
- B. All fence should be at height specified and the bottom of the fabric held 1" above finished grade.

1.02 QUALITY ASSURANCE

- A. Contractor shall be an established firm experienced in field and have been in business a minimum of three (3) years.

1.03 SUBMITTALS

- B. Samples: Three (3) fabric material samples, approximately 6" long of 6" square: post section, and typical accessories.
- C. Shop Drawings: Submit including details illustrating fence height, size of posts, rails, braces, gates, footings, and accessories.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver material in manufacturer's original packing with all the tags and labels intact and legible.
- B. Handle and store material in such a manner as to avoid damage.
- C. No barbed wire permitted.

PART 2 - PRODUCTS**2.01 GENERAL**

- A. Tolerances: Use standard mill tolerances for all framework members and chain link fence fabric.
- B. Round Steel Pipe: Standard weight, Schedule 40, galvanized steel pipe complying with ASTM F 1083. ASTM F 1043, Material Design Group IA, external and internal coating Type A, consisting of not less than 1.8oz./sq. ft. (0.55-kg/sq.m) zinc; and line, end, corner, and pull posts and top rail as required for Light Industrial Fence.

2.02 POSTS, RAILS, AND BRACES:

- A. End, Corner, and Pull Posts: Steel pipe, 3 inch o.d., galvanized in accordance with ASTM A-120.
- B. Line Posts: Steel pipe, 2.5 inch o.d., galvanized in accord with ASTM A-120. Maximum spacing: 10'-0"
- C. Top Rail: Steel pipe, 1.625" o.d. galvanized in accordance with ASTM A-120.

- D. Gate Posts: Steel pipe, galvanized in accord with ASTM A-120 and sized as follows:

<u>Gate Leaf Width</u>	<u>Post Size</u>	<u>Weight Per Linear Foot</u>
Less than 6 feet	2.875 inch	5.79 pounds
6 to 12 feet	4.00 inch	9.11 pounds
12 to 18 feet	6.625 inch	18.97 pounds
Over 18 feet	8.625 inch	24.70 pounds

- E. Post Brace Rails: Match top rail for coating and strength and stiffness requirements. Provide brace rail with truss rod assembly for each gate, end, and pull post. Provide two brace rails extending in opposing directions, each with truss rod assembly, for each corner post and for pull posts. Provide rail ends and clamps for attaching rails to posts.
- F. Tension Wire: Provide No. 7 gauge galvanized coiled spring wire at bottom of fabric.

2.03 CHAIN LINK FABRIC:

- A. Fabric: Helically woven No. 9 gauge wire in a 2 inch mesh. One piece fabric widths for fences up to 12'-0" high.
- B. Selvedge Edges: Knuckle fabric double high knuckled at both bottom selvedge and at top.
- C. Finish: Hot-dip galvanize after weaving in accord with ASTM A-392, Class 2 with 2.0 ounces per square foot of zinc metal coating.

2.04 ACCESSORIES

- A. Coat accessories with same material as fabric and framework.
- B. Post Tops: Pressed steel, or malleable iron. All posts shall have tops.
- C. Tension Wire: Minimum tensile strength of 80,000 psi. Coat wire with not less than .80 oz. of zinc per sq. ft. of surface area. Minimum finished diameter of seven US. Gauge size.
- D. Wire Ties: Minimum nine U.S. gauge size, spaced 14" o.c. for tying fabric to line posts and minimum nine U.S. gauge size, spaced 24" o.c. for tying fabric to rails and braces. For tying fabric to tension wire, use 9 ga. hog rings spaced 24" o.c.
- E. Fittings: Provide fittings for a complete fence installation, including special fittings for corners. Comply with ASTM F 626.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment.
- B. Line Posts: Space line posts uniformly at 10 feet (3.05 m) o.c.
- C. Brace Assemblies: Install braces so posts are plum when diagonal road is under proper tension.

- D. Tension Wire: Install tension wires before stretching fabric and tie to each post with ties or clips.
- E. Fabric: Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and another to framework so that fabric remains in tension after pulling force is released. Apply fabric to outside at enclosing frame work.
- F. Tie Wires: Attach wire to chain-link fabric per ASTM F 626. Tie fabric to line posts at maximum interval of 12 inches (304 mm) o.c. and to braces at maximum interval of 24 inches (609 mm) o.c.
- G. Restore or replace damaged components. Clean and protect work from damage.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement.

1.3 INFORMATIONAL SUBMITTALS

- A. Material certificates.
- B. Material test reports.
- C. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1.5 PRECONSTRUCTION TESTING

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

1.6 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1.
 - 1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

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

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.
- D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.4 CONCRETE MATERIALS

- A. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I/II.
 - 2. Fly Ash: ASTM C 618, Class F or C.
 - 3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

- B. Normal-Weight Aggregates: ASTM C 33/C 33M, graded.
 - 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Air-Entraining Admixture: ASTM C 260/C 260M.
- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- E. Water: ASTM C 94/C 94M and potable.

2.5 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class C. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.7 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.8 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.9 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Normal-Weight Concrete:
 - 1. Minimum Compressive Strength: 3,000 psi or as indicated at 28 days.
 - 2. Maximum W/C Ratio: 0.45.
 - 3. Slump Limit: 5 inches, plus or minus 1 inch.
 - 4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.10 FABRICATING REINFORCEMENT

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

2.11 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

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

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces indicated and to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform field tests and prepare test reports.

END OF SECTION 03300

SECTION 42200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Steel reinforcing bars.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
- C. Samples: For each type and color of the following:
 - 1. Exposed CMUs.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product. For masonry units, include data on material properties and material test reports substantiating compliance with requirements.
- B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 - 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.5 FIELD CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost

or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

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

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
 - 2. Density Classification: Lightweight.
- C. Concrete Building Brick: ASTM C 55.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2500 psi.

2.3 CONCRETE LINTELS

- A. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91/C 91M.
- E. Aggregate for Mortar: ASTM C 144.
 - 1. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- F. Aggregate for Grout: ASTM C 404.
- G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
- H. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.
 - 1. Interior Walls: Hot-dip galvanized, carbon steel.
 - 2. Wire Size for Side Rods: 0.187-inch diameter.
 - 3. Wire Size for Cross Rods: 0.187-inch diameter.
 - 4. Spacing of Cross Rods: Not more than 16 inches o.c.
 - 5. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.

3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

2.8 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 1. Do not use calcium chloride in mortar or grout.
 2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 1. For reinforced masonry, use Type S.
 2. For mortar parge coats, use Type S.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2500 psi.
 3. Provide grout with a slump of 10 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

- 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
- 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
- 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

- 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
- 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
- 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
- 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
- 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

C. Joints:

- 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
- 2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
- 3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- F. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.6 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches.

3.7 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Contractor will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level C in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- D. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.
- E. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- F. Prism Test: For each type of construction provided, according to ASTM C 1314 at seven days and at 28 days.

3.8 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 - 2. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.9 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.
- B. Related Requirements:

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer fabricator.
- B. Welding certificates.
- C. Mill test reports for structural steel, including chemical and physical properties.
- D. Source quality-control reports.
- E. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).

- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 360.
 - 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC 360.
 - 2. Use Allowable Stress Design; data are given at service-load level.
- B. Construction: Combined system of braced frame and shear walls.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
- B. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.
- E. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
- F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
- B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
 - 1. Finish: Mechanically deposited zinc coating.

- C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Plain.
- D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- E. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - 1. Finish: Plain.
- F. Threaded Rods: ASTM A 36/A 36M.
 - 1. Finish: Plain.
- G. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

2.4 PRIMER

- A. Primer: Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting." Section 099600 "High-Performance Coatings." Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."
- B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
- B. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.8 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.
6. Surfaces enclosed in interior construction.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.9 SOURCE QUALITY CONTROL

A. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

B. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

3.3 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: General Contractor will engage a qualified testing agency to perform tests and inspections.
- B. Bolted Connections: Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.

END OF SECTION 051200

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior non-load-bearing wall framing.

1.2 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include layout, spacing, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product certificates.
- C. Product test reports.
- D. Evaluation Reports: For post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
 - 1. Wall Studs: AISI S211.
 - 2. Headers: AISI S212.
 - 3. Lateral Design: AISI S213.

2.2 COLD-FORMED STEEL FRAMING MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
 - 1. Grade: ST33H.
 - 2. Coating: G90 or equivalent.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0598 inch. (16 gage).
 - 2. Flange Width: 1-5/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.

2.4 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

2.5 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

- C. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

- 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780/A 780M MIL-P-21035B or SSPC-Paint 20.
- B. Cement Grout: Portland cement, ASTM C 150/C 150M, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.
- D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.2 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
- D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

- E. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- G. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- H. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.3 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 ERECTION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Miscellaneous steel framing and supports.
 - 2. Miscellaneous steel trim.
 - 3. Metal bollards.
 - 4. Loose bearing and leveling plates.

1.2 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- C. Post-Installed Anchors: Torque-controlled expansion anchors.

2.3 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- D. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
- E. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

2.6 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
- C. Galvanize exterior miscellaneous steel trim.
- D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.7 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
 - 1. Cap bollards with 1/4-inch- (6.4-mm-) thick steel plate.
- B. Fabricate bollards with 3/8-inch- (9.5-mm-) thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch (19-mm) anchor bolts.
- C. Fabricate sleeves for bollard anchorage from steel pipe tubing with 1/4-inch- (6.4-mm-) thick steel plate welded to bottom of sleeve.
- D. Prime bollards with zinc-rich primer.

2.8 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.9 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Galvanize loose steel lintels located in exterior walls.
- C. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.10 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.11 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.

2.12 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer.
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning.", or SSPC-SP 3, "Power Tool Cleaning."
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
- B. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete or in formed or core-drilled holes. Fill annular space around bollard solidly with non-shrink grout.
- C. Anchor bollards in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- D. Fill bollards solidly with concrete, mounding top surface to shed water.

3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

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

END OF SECTION 055000

SECTION 055113 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preassembled steel stairs with concrete-filled treads.
2. Steel tube railings attached to metal stairs.

1.2 ACTION SUBMITTALS

- A. Product Data: For metal pan stairs.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified Florida Registered professional engineer to design stairs and railings.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
 3. Uniform and concentrated loads shall be in accordance with the Florida Building Code and Section 4.5.1 of ASCE 7.
 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
- C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads shall be in accordance with the Florida Building Code and Section 4.5.1 of ASCE 7.

2. Infill of Guards:

- a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
- b. Infill load and other loads shall be in accordance with the Florida Building Code and Section 4.5.1 of ASCE 7.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: [ASTM A 500 (cold formed)] [or] [ASTM A 513].
- D. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, [either commercial steel, Type B, or] structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.
- E. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, [either commercial steel, Type B, or] structural steel, Grade 30 (Grade 205), unless another grade is required by design loads.

2.3 FASTENERS

- A. Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

2.4 MISCELLANEOUS MATERIALS

- A. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- B. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa) unless otherwise indicated.
- C. Welded Wire Reinforcement: ASTM A 185/A 185M, 6 by 6 inches (152 by 152 mm), W1.4 by W1.4, unless otherwise indicated.

2.5 FABRICATION, GENERAL

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

- B. Preamsembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 4 welds: good quality, uniform undressed weld with minimal splatter.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.

2.6 STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Commercial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
 - 1. Fabricate stringers of steel channels.
 - a. Provide closures for exposed ends of channel stringers.
 - 2. Construct platforms of steel channel headers and miscellaneous framing members as needed to comply with performance requirements.
 - 3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
 - 4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal Pan Stairs: Form risers, sub-tread pans, and sub-platforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch (1.7 mm).

2.7 STAIR RAILINGS

- A. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
 - 1. Rails and Posts: 1-1/2-inch- (38-mm-) round top and bottom rails and 1-1/2-inch- (38-mm-) square posts.
 - 2. Picket Infill: 1/2-inch- (13-mm-) [round] [square] pickets spaced less than 4 inches (100 mm) clear.
- B. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 4 welds: good quality, uniform undressed weld with minimal splatter as shown in NAAMM AMP 521.
- C. Form changes in direction of railings by bending or by inserting prefabricated elbow fittings.
- D. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- E. Close exposed ends of railing members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails.
- G. Connect posts to stair framing by direct welding.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
- I. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses.

2.8 FINISHES

- A. Finish metal stairs after assembly.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLING METAL PAN STAIRS

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- B. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints.
- D. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- E. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."

3.2 INSTALLING RAILINGS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
 - 1. Anchor posts to steel by welding or bolting to steel supporting members.
 - 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with post-installed anchors and bolts.

3.3 ADJUSTING AND CLEANING

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

END OF SECTION 055113

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood blocking, and nailers.
2. Plywood panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire Retardant treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.
6. Metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.
- C. Fire Retardant Treated Lumber and Plywood Backer Panels: All lumber and plywood panels shall be fire retardant treated wood product.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPAC U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Separation: Provide 30# asphaltic building paper separation barrier between steel and treated lumber.
- E. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with steel, masonry or concrete.
 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame

front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Where indicated.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Nailers.
 3. Rooftop equipment bases and support curbs.
- B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber of any species.
- C. For concealed boards, provide lumber with 19 percent maximum moisture content and [any of the following species and grades:
1. Mixed southern pine; No. 3 grade; SPIB.
 2. Eastern softwoods; No. 3 Common grade; NeLMA.
 3. Northern species; No. 3 Common grade; NLGA.

2.5 PLYWOOD PANELS

- A. Plywood Panels: DOC PS 1, Exterior, AC in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.
1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Power-Driven Fasteners: NES NER-272.
- C. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- E. Shear Wall Panels: Install shear wall panels to comply with manufacturer's written instructions.
- F. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- G. Do not splice structural members between supports unless otherwise indicated.
- H. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- I. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

3.2 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 064000 – INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide shop-fabricated exposed woodwork and casework:
 - 1. Plastic laminate casework.
 - 2. Plastic laminate countertops.

1.02 SUBMITTALS

- A. Submit for approval samples, shop drawings, product data, mock-ups.

1.03 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Quality standard for fabrication and products: Architectural Woodwork Institute Quality Standards, Premium grade unless noted otherwise.
- B. Plastic laminate: NEMA LD-3, glued-on melamine paper is not allowed.
- C. Base cabinets, wall cabinets, counter tops and backsplashes:
 - 1. Construction: Reveal overlay, Grade M-2 medium-density particleboard substrate, sink cabinet bodies shall have moisture resistant plywood substrate, wall cabinets shall have a clear inside depth of 12 inches, drawer boxes shall be of wood construction, drawers shall have separate front panel attached to drawer box, no staples allowed.
 - 2. Exposed surfaces: High-pressure decorative laminate as follows:
 - a) Horizontal surfaces other than tops: GP-50.
 - b) Vertical surfaces: GP-28.
 - c) Body edges: 0.5 mm PVC, color matched.
 - d) Door/drawer edges: 3 mm PVC tape, machine applied.
 - 3. Semi-exposed surfaces:

- a) Surfaces other than drawer bodies: High-pressure decorative laminate, Grade CL-20.
 - b) Drawer sides and backs: Thermoset decorative overlay.
 - c) Drawer bottoms: Thermoset decorative overlay.
- 4. Countertops: countertops shall be built in lengths that will facilitate ease of replacement.
 - a) Core: Plywood, provide with backer sheet for balanced construction, water-resistant plywood shall be used where a sink is installed.
 - b) Laminate: GP-50.
 - c) Edge: 1-1/2" self-edge, 3-mm PVC, machine applied.
 - d) Backsplash: 3/4" x 4", butted to countertop, caulk joint to match laminate.
- 5. Adjustable shelving: 32 mm in-line boring with double-pin reinforced plastic shelf supports.
 - a) Edge: 0.5 mm PVC, color matched, all four edges.
- D. Hardware: Steel or brass with satin-chromium plate finish. Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard
 - 1. Drawer slides: BHMA B05091; zinc-plated, ball bearing side-mount full-extension, minimum 75-lbf rating, provide 150-lbf rating at file drawers.
 - 2. Hinges: BHMA B01521; 2-3/4" x .095" semi-concealed, 5-knuckle.
 - 3. Catches: BHMA B03091; metal single-roller catch, magnetic catches are not allowed. Provide Heavy Duty roller catches only.
 - 4. Pulls: BHMA B02011; 4" back-mounted steel or brass wire pulls.
 - 5. Locks: BHMA E07261; cam lock, key removable in locked and unlocked positions, all locks shall be keyed alike.
 - 6. L-brackets: Epoxy coated 5 mm steel bar, Knape & Vogt 208 WH or approved equal.
 - 7. Grommets: 2" diameter molded black plastic countertop grommet with slot for wire/cable passage and matching plastic cap at each open knee space.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with AWI quality standards and mark each piece with manufacturer's identification and AWI quality grade. Comply with details shown for profile and construction features.
 - 1. Casework: AWI premium grade, laminate covered reveal overlay construction, institutional hardware quality level.
 - 2. Countertops: AWI premium grade, butted backsplash and self-edge at front lip.

- B. Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Install work plumb, level, true and straight, scribe to fit. Anchor securely with concealed fasteners.
- D. Repair or replace damaged work, clean, lubricate and adjust hardware; protect work until final acceptance.

END OF SECTION

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber blanket insulation
 - 2. Mineral wool Blanket insulation
 - 3. Retrofit Ceiling and Wall insulation

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product test reports.
- C. Research/evaluation reports.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. CertainTeed Corporation.
 - 2. Guardian Building Products, Inc.
 - 3. Johns Manville.
 - 4. Knauf Insulation.
 - 5. Owens Corning.
- B. Unfaced, Glass-Fiber Acoustical Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics, for use in acoustical applications.
- C. Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

2.2 MINERAL-WOOL BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Fibrex Insulations Inc.
 - 2. Owens Corning.
 - 3. Thermafiber.
- B. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.3 RETRO-FIT CEILING AND WALL INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Guardian "Energy Saver FP" – basis of design.
 - 2. Thermal Design Inc. – "Simple Saver System".
- B. Faced, Glass Mineral-Wool Blanket Insulation: ASTM C 665, Type II (blankets with membrane facing); Class C, Category 1; consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics, free of formaldehyde.
- C. Fabric: Woven reinforced high density polyethylene yarn, coated on both sides with a white polyethylene coating with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics, with a maximum perm rating of 0.02 perm.
- D. Adhesive: Manufacturer's standard high shear and high tack adhesive.
- E. Patch Tape: Manufacturer's standard patch tape to match appearance of fabric.
- F. Foam Tape: Manufacturer's standard as required to reduce heat transfer.
- G. Steel Banding: Manufacturer's standard painted steel banding as required to pass 400 pound drop test minimum per OSHA 1926.502.
- H. Accessories: Provide all required manufacturer's accessories for a complete installation.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch (76 mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu.m).
 - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

END OF SECTION 072100

SECTION 077100 – HIGH PERFORMANCE ROOF COATING

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide a high performance, high solids silicone coating for existing metal roof panels.

1.02 SCOPE

A. The extent of the work is indicated on the drawings and is further defined by provisions of this section which includes coating, flashing and reinforcing of seams, joints and transitions, and roof accessories specifically related to the roof installation. Areas to be coated include existing metal roofs as indicated on the drawings or contract documents.

1. Cleaning and preparation of substrate.
2. Application of primers and surface treatments (where required).
3. Detailing of flashings and penetrations.
4. Application of roof coating in two coats (as required).

1.03 SUBMITTALS

- A. Exhibits: Submit copy of literature, technical product data sheets, detail drawings, installation instructions and material safety data sheets for each product as required. Submit copy of Coating Roofing System Warranty for appropriate term.
- B. Samples: Submit sample of warranty and products as required.
- C. Applicator Authorization: Firm shall possess written authorization from manufacturer which certifies they are approved for installation of the specified system.
- D. Provide owner or assist owner in preparation and submittal of roof installation acceptance certification(s) that may be required for insurance coverage on roofing and roof related work.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide primary products, by a single manufacturer for use with the specified Roof Coating System.
- B. Applicator Qualifications: A single Applicator, Installer or Firm ("Roofer") specializing in the type of work required, employing only experienced workers for the class of work in which they are employed, shall perform all work addressed in this section, and shall be certified by the manufacturer for installation of the Coating Roofing System.
- C. Application of materials shall be in accordance with the manufacturer's recommendations.

1.06 REGULATORY REQUIREMENTS

A. Follow all regulatory and local building codes where applicable.

1.07 PRE-INSTALLATION MEETING

A. Approximately two (2) weeks prior to the scheduled start of roofing installation and related work, conduct a pre-installation meeting at the project site with Applicator Firm, Architect/Owner, Manufacturer's representative and any other persons associated with the project.

The purpose of this meeting is to review foreseeable methods and procedures related to roofing work, including but not necessarily limited to the following:

1. Review areas of roofing substrates to inspect and discuss conditions of substrate, penetrations and other preparatory work to be performed.
2. Review Coating Roofing System requirements.
3. Review required submittals.
4. Review and finalize construction schedule related to roofing work, and verify availability of materials, Applicator's personnel, equipment and facilities needed to consistently make progress and avoid delays.
5. Review required inspection(s), testing, certifying and material usage accounting procedures.
6. Review weather and forecasted weather conditions, as well as procedures for coping with unfavorable conditions including possibility of temporary roofing work.

1.08 DELIVERY AND STORAGE

A. Deliver materials in manufacturer's original unopened packaging with all tags and labels intact and legible.

B. Stored materials shall be protected from weather and abuse to ensure there is no possibility of contamination.

C. Store in a cool, dry weather-tight place at temperatures between 50°F and 80°F until product is ready to be applied. Keep from freezing.

D. Moisture sensitive products shall be maintained in a dry storage area or properly covered.

E. Do not stack material pallets more than two (2) high.

F. No storage of materials shall be permitted on roof areas other than those materials that are to be installed the same day.

1.09 ENVIRONMENTAL CONDITIONS

A. Proceed with roofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturer's specifications, recommendations and guarantee requirements as follows:

1. Rain is not expected within twenty-four (24) hours of application, or if temperatures are expected to fall below 45°F (7.2°C) during the duration of the job.
2. Surface is at least 5°F (3°C) above the dew point.
3. Upper temperature restriction (both air and substrate) for application of Coating products is 120°F (49°C). If the substrate temperature exceeds 120°F (49°C), Coating products should be applied during cooler periods of the day. If this is not practical, the metal substrate can be cooled with water, and then products applied just after the water has flashed-off. No moisture can be present when applying Coating products.

1.10 SUBSTRATE CONDITIONS

- A. If any questions arise regarding the compatibility of Coating products with an existing substrate, the Applicator shall apply a test area to check adhesion (see Part 3 of this specification).

1.11 GUARANTEES

- A. Provide Manufacturer's Coating Roofing System No Dollar Limit (NDL) Labor and Material Guarantee where the manufacturer agrees to repair or replace the portion of the roofing materials, which have resulted in a leak due to a manufacturing defect or defects caused by ordinary wear and tear or workmanship.
- B. Duration: Ten (10) Years Labor & Material (NDL) from the date of final completion.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Everroof or approved equal. Basis of design is Ever-Silic, fluid applied, high solids (HS) Silicone Coating System for metal roofing.

2.02 MATERIALS

- A. Listed drying times for various products are directly affected by environmental conditions and thickness of application. Additional drying time must be allowed when experiencing high relative humidity, low temperatures and/or very thick product application to prevent improper curing and/or product "wash-off".

- B. Primer:

Single component high solids red oxide alkyd primer for steel surfaces. (Primer 55) Translucent red rust inhibitor is to be applied over any areas of rust that remain on the substrate after pressure washing. Do not apply in temperatures under 45°F (7.2°C).

C. Base and Top Coat:

Single component, moisture cured, low VOC, elastomeric silicone base and top coat formulated with high volume solids. low viscosity, high body emulsion polymer based on pure acrylic resins that is designed to provide excellent waterproofing capabilities and is used as a base coat in conjunction with a top coating. Curing is enhanced by UV exposure. Do not apply in temperatures under 45°F (7.2°C).

Application Rate:24 wet mils @ 1.5 gal/ 100 sq. ft
Application Method: Brush or airless sprayer
Application Temperature (air, surface):.....45°F - 120°F
Solids by Weight (ASTM D-2396):98 ± 3%
Solids by Volume (ASTM D-2697): 98 ± 3%
Tensile Strength (ASTM D-2370):300 psi
Elongation (ASTM D-412):200%
Hardness Shore A (ASTM D-2240): 55 ± 2%
Tear Strength (ASTM D-624):45 pli (7.88 N/mm)
Color:White
Viscosity (@ 77°F nominal)8,000 – 11,000 cps
Specific Gravity: 1.34
VOC (ASTM D-2396-81): < 48 grams/liter

D. Flashing Compound:

Manufacturer's standard white, elastomeric flashing compound designed to form seals in stress and expansion/flashing areas. Cured mastic is UV and water resistant. Do not apply in temperatures under 45°F (7.2°C).

E. Reinforcing Fabric:

Manufacturer's standard non-woven, spun-bonded polyester fabric that must be used in conjunction with Flashing Compound at all seams, roof penetrations, joints or changes in plane that have high shear or stress.

F. Butyl Seam Tape:

Manufacturer's standard self adhesive, modified butyl rubber seam tape with polyester fabric facing. Used for sealing all seams, roof penetrations, joints or changes in plane that has high shear or stress.

G. Closures:

Provide closures of type and size as required for complete roof system.

PART 3 - EXECUTION

3.01 SUBSTRATE PREPARATION – METAL ROOF

A. Applicator shall follow local codes and other applicable regulatory codes as it applies to the installation of the Roof Coating System. Manufacturer's installation instructions shall be followed as a minimum standard.

B. All surfaces where the Roof Coating System is to be applied shall be clean, sound, dry and free of loose/peeling paint, dirt, debris, grease, oil, mildew and other detrimental foreign materials.

C. The Applicator shall inspect the substrate to ensure that it is structurally sound. Do not proceed with installation of the Roof Coating System until all unsatisfactory conditions have been corrected in a manner acceptable to the manufacturer.

D. Preparation of the roof substrate is the responsibility of the Applicator. The applicator shall prepare the roof substrate to receive the Roof Coating System. The following conditions must be addressed and corrected prior to the application of the Roof Coating System:

1. Cleaning: Metal substrates must be pressure-washed with water. A minimum working pressure of 2,500 psi shall be used to remove all dirt, dust, waste products (oil, oil-based roof cements, solvents, grease, animal fats, etc.) and old paints and coatings which are delaminating.
A roto-spray tip is required to expedite metal panel cleaning. All existing silicone-based sealants must be completely removed from roof substrate prior to application of Roof Coating System.
In some cases, a sand injection system may be required during the pressure-washing to satisfactorily prepare the substrate and allow proper adhesion of the Roof Coating System.
A bleach solution must be used on substrates to kill and remove living organisms such as algae, mildew, mold or fungus.
2. Damaged Metal Panels: The Applicator shall repair dented and/or damaged metal roof panels. Dents shall be mechanically removed to the maximum extent possible. Damaged panels that cannot be repaired or capped with sheet metal must be removed and replaced. Broken ribs shall be covered with a sheet metal cap. Sheet metal rib caps must be "sealed" to the roof by applying a layer of Mastic Flashing Compound over the entire broken rib area to be capped. The new metal cap is then set into the sealant prior to attaching the cap with sheet metal fasteners. Then, Mastic Flashing Compound or Butyl Seam Tape shall be used to seal all the newly created rib cap seams.
3. Gaps: All large or excessive gaps between roof panels must be closed or made flush with self-drilling fasteners designed for metal panels. Closed-celled foam strips or polyurethane foam may be used to pre-fill voids larger than 1/4 inch before applying Mastic Flashing Compound and Reinforcing Fabric or Butyl Seam Tape. Foam shall be cut and shaped with a utility knife or other method to create a canted edge which

assists both membrane adhesion and water drainage, as well as, prevents shearing of the fabric on the metal edges.

4. **Ponding Water Areas:** The Applicator shall eliminate all ponding water areas on the roof prior to application of the Roof Coating System products ("ponding water" is defined as water which does not properly drain and remains for more than 24 hours after precipitation stops). Ponding water areas which cannot be eliminated shall be treated with Modified Acrylic Coating in lieu of other specified Coatings.
5. **Re-securement of Fasteners:** All fasteners must be re-tightened, re-secured or replaced, as necessary. All missing fasteners must be replaced. All stripped fasteners must be replaced with a larger diameter fastener sufficient in size to secure the panels together. An additional fastener must be added next to the one that was stripped.
6. **Sheet Metal Crickets:** Sheet metal crickets shall be installed according to metal roof manufacturer's specifications (minimum 26 gauge metal - heavier gauge required for large crickets) on the high side of all curb units. Vertical ribs shall be cut a minimum of 2" from the cricket to allow both the cricket flanges to mount flush to the metal panel and allow for water drainage. Cut vertical ribs shall then be treated in the same fashion as a void larger than a 1/4 inch. New cricket flanges shall be set in a continuous bead of Flashing Compound before they are mechanically attached to the curb unit and metal roof panel. The cricket flanges shall be secured in place to the curb unit and the metal roof panel while the Mastic Flashing Compound is still wet using appropriate stitch-screwing fasteners. Follow this procedure for installation of all new crickets and curbs.
7. **Residual Asphalt:** The Applicator shall make every effort to remove asphaltic materials from the surfaces to which the Roof Coating System is to be applied. Removal methods may include, but are not limited to pressure-washing, scraping, wire brush, electrical drill wire-wheels, or other similar tools. Residual asphalt shall be deemed as asphaltic materials, greater than 3 mils thickness, that remain after the exercise of all required removal efforts. Residual asphalt areas shall be treated in the following manner: Apply one coat of Primer over the affected area. Allow drying and then apply one coat of Acrylic Coating over the asphaltic area.
8. **Rust Areas:** All rust areas must be treated with Primer to prevent further deterioration of the metal roof panels.
Remove all loose, flaking or powdery rust by wire brushing if it has not been removed during the pressure washing. All rust areas shall be completely covered by the Primer. Apply Primer only to rusted areas and residual asphaltic areas. Areas where rust is very heavy on roof panels shall be treated with two (2) applications of Primer. Roof panels that are corroded to the point where they have holes shall be replaced. The substrate temperatures must be kept below 120°F when applying Primer. (See section 1.08, Environmental Conditions, of this specification for recommended method of cooling substrate).
9. **Preparation of Test Patches:** The Applicator shall prepare no less than three (3) test patches for all questionable roof substrates. Substrates that are considered questionable

include but are not limited to: coated metal panels, Kynar®-500 surfaces or other fluoropolymers, and coatings which contain silicone, etc. To verify adhesion of the Roof Coating products, a minimum test patch size shall be one (1) square foot. The test patch of the Roof Coating product shall be prepared with and without Acrylic Adhesive Primer. After the test patches have been applied, allow at least one week of drying time before checking adhesion. Check adhesion by slicing an "X" (approx. 6" in size) near the center of the test patch. Then try to remove the roofing membrane material at the center of the "X" with a spatula. Test patches shall be labeled and photographed to document adhesion test results. The Applicator shall consult with the coating manufacturer Technical Services Department concerning all adhesion test results.

10. Miscellaneous Items:

- a. Neoprene Pipe Boots: Neoprene boot flanges must be set in a continuous bead of Mastic Flashing Compound prior to mechanical attachment with fasteners. Contact Roof Coating Manufacturer Technical Services Department for particulars.

3.03 SEAM TREATMENT AND FLASHING APPLICATION- METAL ROOF

A. After completion of substrate preparation, all flashing details, horizontal seams, penetrations and curbs must be flashed with either 4" or 6" Butyl Seam Tape or a three course application of Mastic Flashing Compound and Reinforcing Fabric in accordance with coating manufacturer Detail Drawings. The Mastic Flashing Compound must be feathered at the edges so that water can easily flow over the flashing conditions.

B. Fasteners: All fasteners must be re-tightened, re-secured or replaced, as necessary. All missing fasteners must be replaced. All stripped fasteners must be replaced with a larger diameter fastener sufficient in size to secure the panels together. An additional fastener must be added next to the one that was stripped.

C. Gutter Straps: Gutter straps that are attached to the roof panels must be totally encapsulated with Mastic Flashing Compound, including the fasteners.

D. Horizontal Seams: All horizontal seams must be reinforced with at least a 6" wide layer of Butyl Seam Tape when fasteners are within 1" of the end lap. Center tape to seal both fasteners and lap. Install a 4" wide layer of Butyl Seam Tape when fasteners are at least 1 ½" away from the end lap. Align tape below fastener without sealing over the fastener head. As an alternative, horizontal seams may be sealed with a layer of 6" wide Polyester Reinforcing Fabric set in a uniform layer of Mastic Flashing Compound. A final layer of Mastic Flashing Compound shall be applied over the reinforcing fabric to completely encapsulate the fabric. The Mastic Flashing Compound must be feathered at least 1" beyond each side of the fabric to allow water to flow over the seam. The Polyester Reinforcing Fabric must be cut around all fasteners so it lies flat without voids or wrinkles. For ribbed roof panels, the Reinforcing Fabric must be applied over panel ribs in continuous lengths. A minimum 2" overlap is required for all splices in Polyester Reinforcing Fabric.

E. Vertical Seams:

1. Batten: Both vertical seams of the battens must be sealed with a bead of Mastic Flashing Compound. Feather the flashing compound until the seam is completely covered. The flashing compound should be brushed and feathered uniformly in the direction parallel to the seam.
 2. Corrugated: Apply a 2" wide strip of Butyl Seam Tape to all corrugated panel vertical seams or seal with a bead of Mastic Flashing Compound. Feather the flashing compound until the seam is covered. The flashing compound should be brushed and feathered uniformly in the direction parallel to the seam.
 3. Inverted "J" Seam (Double Lock): Ensure that the seams are tightly crimped. It may be necessary to re-crimp any loose seams with a portable seamer.
 4. Ribbed: Apply a 2" wide strip of Butyl Seam Tape to all ribbed panel vertical seams or seal with a bead of Mastic Flashing Compound. Feather the flashing compound until the seam is covered. The flashing compound should be brushed and feathered uniformly in the direction parallel to the seam.
 5. Standing Seam: It is not necessary to seal vertical seams on standing seam roofs..
 6. Standing "T" Seam: It is not necessary to seal vertical seams on standing seam roofs.
- F. Cinch Straps at Panel End Laps: Re-tighten cinch straps, as necessary. The entire lap, strap and fastener head shall be completely covered with a minimum 6" wide layer of polyester reinforcing fabric set in a uniform layer of Mastic Flashing Compound. A final layer of Mastic Flashing Compound shall be applied over the reinforcing fabric to completely encapsulate the fabric. A bead of Mastic Flashing Compound shall also be inserted into the cinch strap water channel to displace all air and moisture within the channel. Feather the flashing compound to prevent ponding water at the high side of the lap. As an alternative, Butyl Seam Tape may be used in lieu of three coursing for cinch straps at panel end laps.
- G. Ridge Caps: Except as noted, all ridge caps must be sealed with a 6" wide layer of Butyl Seam Tape or a 6" wide layer of polyester Reinforcing Fabric set in a uniform layer of Mastic Flashing Compound. A final layer of Mastic Flashing Compound shall be applied over the reinforcing fabric to completely encapsulate the fabric. All voids and open areas in the ridge cap must be filled with polyurethane foam prior to application of the Seam Tape or the flashing compound.
- H. Rakes: All fixed rakes must be secured and sealed with a 6" wide layer of Butyl Seam Tape or a 6" wide layer of Polyester Reinforcing Fabric set in a uniform layer of Mastic Flashing Compound. A final layer of Mastic Flashing Compound shall be applied over the reinforcing fabric to completely encapsulate the fabric. The flashing compound must be feathered at least 1" beyond each side of the fabric to allow water to flow over the seam. If the fixed rake metal is fastened to the top of the roof panel ribs and extends back onto roof, it will be necessary to trim off excess metal and follow horizontal seam flashing procedures. All voids and open areas must be filled with polyurethane foam prior to the application of the Seam Tape or flashing compound.
- I. Curb Flashings: All curb flashings, including cricket details, must be flashed with at least a 6" wide layer of Butyl Seam Tape or a 6" wide layer of polyester reinforcing fabric set in a uniform layer of Mastic Flashing Compound. A final layer of Mastic Flashing Compound shall

be applied over the reinforcing fabric to completely encapsulate the fabric. The flashing compound must be feathered at least 1" beyond each side of the fabric to allow water to flow over the seam. Do not bridge fasteners. The Polyester Reinforcing Fabric must be cut around all fasteners so it lies flat without voids or wrinkles.

- J. Penetrations: Seal around the base of the penetration with a 6" wide layer of Butyl Seam Tape or a 6" wide layer of Polyester Reinforcing Fabric set in a uniform layer of Mastic Flashing Compound. A final layer of Mastic Flashing Compound shall be applied over the reinforcing fabric to completely encapsulate the fabric. The flashing compound must be feathered at least 1" beyond each side of the fabric to allow water to flow over the flange joint. Cut Polyester Reinforcing Fabric to accommodate the shape of the penetration. Extend the flashing compound 2" up the vertical of the penetration. Both the top and bottom of neoprene pipe boots shall be flashed as described above.
- K. Gutters: The gutter must be completely clean and dry before sealing gutter seams. a 6" wide layer of Butyl Seam Tape or a 6" wide layer of Polyester reinforcing fabric set in a uniform layer of Mastic Flashing Compound. A final layer of Mastic Flashing Compound shall be applied over the reinforcing fabric to completely encapsulate the fabric. The flashing compound must be feathered at least 1" beyond each side of the fabric to avoid ridges inside the gutter. Where the flashing compound is applied to the exterior of the gutter seam, it is recommended that a narrow width putty knife be used to spread the flashing compound smoothly.

3.04 COATING APPLICATION METAL ROOF

A. Metal Roof Coating System:

1. Apply a base coat of Primer to the properly prepared metal roof substrate at the rate of 0.33 gal per 100 square feet (5 wet mils). The primer base coat shall be applied parallel to the ribs of roof panels. Allow at least 24 hours drying time, and then inspect the base coat for defects, flaws or holidays. Correct any unsatisfactory conditions.
2. Spray-apply an intermediate coat (white) of Silicone Roof Coating over the primer base coat at the rate of 1.50 gal per 100 square feet (24 mils wet). The intermediate coat shall be applied parallel to the ribs of the roof panels. It should not be applied unless the base coat is clean and will provide proper adhesion. Allow a minimum of 24 hours drying time prior to allowing foot traffic or inspection of roof surface.
3. Spray-apply a finish coat (white) of Silicone Roof Coating over the base coat at the rate of 1.50 gal per 100 square feet (24 mils wet). Finish coat shall be applied parallel to the ribs of the roof panels. It should not be applied unless the base coat is clean and will provide proper adhesion. Allow a minimum of 24 hours drying time prior to allowing foot traffic or inspection of roof surface.
4. After at Least 24 Hours Has Elapsed, inspect the final roof surface for flaws, holidays, insufficient thickness, etc. Total acceptable dry mil thicknesses are 35-38 mils field and 65

mills on seams and flashing details for this system. At the completion of all work, the seams should not be visible on the roof. All unsatisfactory areas must be repaired.

3.05 INSPECTIONS AND GUARANTEES

- A. Contractor shall inform the Roofing Coating Manufacturer Technical Services Department upon completion of all preliminary work and flashing details and that the Applicator is ready to proceed with the application of Roof Coating System.
- B. Allow a minimum of two (2) weeks for the interim inspection to be made by the Roof Coating Manufacturer Technical Services Department. Any final roofing installation prior to this interim inspection is subject to rejection by the Roof Coating Manufacturer.
- C. Any areas that require corrective action that are outlined in an interim or final inspection shall be corrected by the Applicator in a timely manner to the satisfaction of the Roof Coating Manufacturer.
- D. Up to two (2) inspections (interim and final) shall be free of charge. Additional inspections are at the contractor's expense.

3.06 OTHER ITEMS

- A. The Applicator shall take photographs of representative roof areas, including detail work, at the following intervals (minimum):
 - Before work commences.
 - After roof has been thoroughly cleaned and prepared for application of the Roof Coating System products.
 - After all flashing and detail work has been performed.
 - After spray application of roof Coating System.
- B. The Applicator shall provide the following support for on-site inspections by a representative from the roof coating manufacturer Technical Department (list is not comprehensive):
 - Representative from Applicator Firm who has authority to make binding decisions.
 - Required means to access all areas of the treated roof (e.g., various ladders).
 - Previous photographs of the roof including test patch results, as applicable.
 - Roof Coating products and application equipment required to repair roof areas where destructive tests are to be performed by the Roof Coating Manufacturer Technical Services Department.
- C. Repairs to roof coating: In the event that the roof coating membrane is damaged or punctured, for example, through the installation of new roof equipment, etc., repairs are to be made using Mastic Flashing Compound and Polyester Reinforcing Fabric (where necessary) as follows:
 - Damaged areas are to be cut, cleaned and dried.

- Apply Mastic Flashing Compound, brushed and feathered out onto the existing membrane.
- If a new penetration area has been cut, embed Polyester Reinforcing Fabric into the Mastic Flashing Compound according to standard Roof Coating specifications.
- Once the Mastic Flashing Compound has cured, Roof Coating System (white or appropriate color) may be applied for aesthetic uniformity.

END OF SECTION 077100

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
 - 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- C. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
- D. Product test reports.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
- B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by UL.
 - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems bearing marking of qualified testing and inspection agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Grace Construction Products.
 2. Hilti, Inc.
 3. Johns Manville.
 4. 3M Fire Protection Products.
 5. Tremco, Inc.; Tremco Fire Protection Systems Group.
 6. USG Corporation.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any. Firestopping shall be colored red.
- B. Penetrations in Fire-Resistance-Rated Walls: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
1. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 2. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. VOC Content: Provide penetration firestopping that complies with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Install penetration firestopping to comply with both Underwriter's Laboratory design and manufacturer's written installation instructions and published drawings for products and applications indicated.
- C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- D. Install fill materials for firestopping by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.3 FIELD QUALITY CONTROL

- A. Engage a qualified testing agency to perform tests and inspections. Testing Agency shall provide a written report certifying all the fire stopping has been installed in accordance with the

appropriate UL design and manufacture's installation instructions. Certification shall be available at the Agency for Health Care Administration's 100% Construction Survey.

- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Urethane joint sealants.
 - 3. Latex joint sealants.
 - 4. Acoustical joint sealants.

1.2 PRECONSTRUCTION TESTING

- A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each kind and color of joint sealant required.
- C. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.
- D. Product test reports.
- E. Preconstruction compatibility and adhesion test reports.
- F. Preconstruction field-adhesion test reports.
- G. Field-adhesion test reports.
- H. Warranties.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.5 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.

2.2 SILICONE JOINT SEALANTS

- A. Silicone Joint Sealant: ASTM C 920.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. BASF Building Systems.
 - b. Dow Corning Corporation.
 - c. GE Advanced Materials - Silicones.
 - d. Pecora Corporation.
 - e. Sika Corporation; Construction Products Division.
 - f. Tremco Incorporated.
 - 2. Type: Single component (S).
 - 3. Grade: nonsag (NS).
 - 4. Class: 50.
 - 5. Uses Related to Exposure: Nontraffic (NT).

2.3 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Use NT, M, A, G, O, and I.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF "Sonolastic – NP-1"

2.4 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation.
 - b. USG Corporation.

2.5 JOINT SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
 - 1. Remove laitance and form-release agents from concrete.
 - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
- F. Acoustical Sealant Installation: Comply with ASTM C 919 and with manufacturer's written recommendations.
- G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Standard interior and galvanized exterior hollow metal frames.
 - 2. Galvanized insulated exterior hollow metal doors.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.
- C. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.
- D. Exterior Door and Frames: Furnish exterior doors and frames that are tested and approved with a current Florida Product Approval or Miami-Dade Notice of Acceptance for large missile impact rated doors, meeting wind loads as indicated on the drawings.

1.3 QUALITY ASSURANCE

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.
 - 1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Amweld Building Products, LLC.
 - 2. Ceco Door Products; an Assa Abloy Group company.
 - 3. Curries Company; an Assa Abloy Group company.

4. Pioneer Industries, Inc.
5. Security Metal Products Corp.
6. Steelcraft; an Ingersoll-Rand company.
7. Windsor Republic Doors.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, CS, Type B; suitable for exposed applications.
- B. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 4 OZ (12G) coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- D. Mineral-Fiber Insulation: ASTM C 665, Type I.

2.3 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8.
- B. Interior Frames: Fabricated from cold-rolled steel sheet.
 1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as welded unless otherwise indicated.
 3. Frames for Level 1 Steel Doors: 0.042-inch-(1.0-mm-) thick steel sheet.
- C. Exterior Frames, Heavy Duty Doors and Frames: Fabricated from metallic coated sheet steel, min. thickness .042", with min. A40 (ZF120) coating.
 1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as welded unless otherwise indicated.
 3. Frames for Level 1 Steel Doors: 0.042-inch-(1.0-mm-) thick steel sheet.
 4. Exterior doors shall be insulated.
- D. Hardware Reinforcement: ANSI/SDI A250.6.

2.4 EXTERIOR STANDARD STEEL DOORS

- A. Construct hollow-metal doors to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B.
 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).

- c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm), with minimum A60 (ZF180) coating.
- d. Edge Construction: Model 2, Seamless.
- e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
- f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
- g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
- h. Core: Manufacturer's standard with insulation.

2.5 COMMERCIAL DOORS: NAAMM-HMMA 861; SDI A250.4, Physical Performance Level A.

A. Doors:

- a. Type: As indicated in the Door and Frame Schedule.
- b. Thickness: 1-3/4 inches (44.5 mm).
- c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
- d. Edge Construction: Continuously welded with no visible seam.
- e. Core: Steel stiffened.
- f. Fire-Rated Core: Manufacturer's standard vertical steel stiffener and/or laminated mineral board core for fire-rated and temperature-rise-rated doors.

2.6 FRAME ANCHORS

A. Jamb Anchors:

- 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
- 2. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

- 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
- 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (50 mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.7 STOPS AND MOLDINGS

A. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

- B. Ceiling Struts: Minimum ¼-inch-thick by 1-inch- (6.4-mm-thick by 25.4-mm-) wide steel.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

2.9 FABRICATION

- A. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- B. Hollow Metal Frames: Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - 4. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
 - 5) Two anchors per head for frames more than 42 inches (1066 mm) wide and mounted in metal-stud partitions.
 - b. Compression Type: Not less than two anchors in each jamb.
 - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
 - 2. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers.
 - a. Single-Door Frames: Three door silencers.
 - b. Double-Door Frames: Two door silencers.
- C. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 electrical Sections.

- D. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 4. Provide loose stops and moldings on inside of hollow metal work.
 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.10 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
1. Shop Primer: ANSI/SDI A250.10.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hollow Metal Frames and Doors: Comply with ANSI/SDI A250.11.
1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. Exterior door and frames shall be installed in strict accordance with the Florida Product Approval and / or Miami-Dade Notice of Acceptance installation requirements. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - d. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post installed expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of post installed expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 4. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- B. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.2 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

3.3 PROJECT PHOTOGRAPHS

- A. Take photographs of all installed anchors and support assemblies that will be covered with finish materials prior to concealing anchors and supports from view. Photographs shall be available at the Agency for Health Care Administration 100% Construction Survey

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with wood veneer faces.
 - 2. Factory finishing flush wood doors.

1.2 SUBMITTALS

- A. Product Data: For each type of door indicated include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate dimensions and locations of cutouts.
 - 3. Indicate requirements for veneer matching.
 - 4. Indicate doors to be factory finished and finish requirements.
 - 5. Indicate fire-protection ratings for fire-rated doors.
- C. Samples: For factory-finished doors.

1.3 QUALITY ASSURANCE

- A. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
- B. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Algoma Hardwoods, Inc.
 - 2. Ampco, Inc.
 - 3. Chappell Door Co.

4. Eggers Industries.
5. Graham; an Assa Abloy Group company.
6. Ipik Door Company.
7. Marlite.
8. Marshfield Door Systems, Inc.
9. Mohawk Flush Doors, Inc.; a Masonite company.
10. Oshkosh Architectural Door Company.
11. Vancouver Door Company.
12. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. WDMA I.S.1-A Performance Grade:

1. Extra Heavy Duty.

B. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

- a. Screw Withdrawal, Edge: 400 lbf (1780 N).

C. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.

D. Interior Solid-Core Doors

1. Grade: Premium, with Grade AA faces.
2. Species: Select white birch.
3. Cut: Rotary Cut.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Balance match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Core: Structural composite lumber.
8. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
9. Construction: Seven plies, either bonded or nonbonded construction.

2.3 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

- B. Factory machine doors for hardware that is not surface applied.
- C. Openings: Cut and trim openings through doors in factory.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
 - 3. Louvers: Factory install louvers in prepared openings.

2.4 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Finish doors at factory that are indicated to receive transparent finish. Field finish doors indicated to receive opaque finish.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: AWI catalyzed polyurethane system.
 - 3. Staining: As selected by Architect from manufacturer's full range.
 - 4. Effect: Filled finish.
 - 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hardware: For installation, see Division 08 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide ¼ inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.

- a. Comply with NFPA 80 for fire-rated doors.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

END OF SECTION 081416

SECTION 084100 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior storefront framing.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Noise or vibration created by wind and by thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Failure of operating units.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Where anchor inspections are required, sill design with appropriate access for building official visual inspection capability will be provided.
2. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.

1.3 Hurricane Resistance Performance for exterior applications: Provide aluminum storefront systems that comply with performance requirements indicated, as demonstrated by testing manufacturer's assemblies in accordance with test method indicated.

1. Large Missile Impact per Miami – Dade County Building Code Compliance Office (BCCO) protocol (TAS 201) test requirements.
2. Cyclic Load Test per Miami – Dade County Building Code Compliance Office (BCCO)

protocol (TAS 203) test requirements.

3. Uniform Static Load Test per Dade – County Building Code Compliance Office (BCCO) protocol (PA-202 and ASTM –E330).

- A. Wind Loads: Per structural drawings

Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch (19 mm), whichever is less, at design pressure based on testing performed in accordance with ASTM E 330-90 with allowable stress in accordance with AA Specifications for Aluminum Structures.

- B. Windborne-Debris Resistance: Provide aluminum and glass system capable of resisting impact from windborne debris, based on the pass/fail criteria as determined from testing glazed system identical to specified product, according to ASTM E 1886 and testing information in ASTM E 1996 or AAMA 506 and requirements of authorities having jurisdiction.
- C. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m)] of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).
- D. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
- C. Samples: For each type of exposed finish required.
- D. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Product test reports.
- F. Field quality-control reports.
- G. Maintenance data.
- H. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Certified in writing by system manufacturer as qualified for installation of specified systems.
- B. Perform Work in accordance with AAMA SFM-1 and manufacturer's written instructions.
- C. Conform to requirements of ANSI A117.1 and local amendments.
- D. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- E. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- F. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
- G. Source Limitations for Aluminum-Framed Systems: To ensure quality of appearance and performance, obtain materials for systems from either a single manufacturer or from manufacturer approved by systems manufacturer.
- H. Pre-installation Conference: Conduct conference at Project site with representatives from manufacturer, Aluminum & Glass Subcontractor, General Contractor and Architect participating in conference.

1.5 WARRANTY

- A. Special Product Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Exterior Storefront Basis of Design Product: Subject to compliance with requirements, provide Coral Architectural Products - FL 550 Storefront Window System, wet glazed, insulated glazing, large missile impact resistant, or approved equal.
- B. Substitutions: Submit under provisions of Section 001250, a minimum of 10 days prior to bid date.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308/B 308M.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally broken.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

- F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ACCESSORY MATERIALS

- A. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

2.6 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing from exterior.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

- A. Dark Bronze Anodic Finish to match existing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Comply with Florida Product Approval and / or Miami Dade Notice of Acceptance details.
3. Do not install damaged components.
4. Fit joints to produce hairline joints free of burrs and distortion.
5. Rigidly secure nonmovement joints.
6. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing and metal spandrel panels as specified in Division 08 Section "Glazing."

3.2 FIELD QUALITY CONTROL

A. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 084100

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - 2. Cylinders for door hardware specified in other Sections.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Other Action Submittals:
 - 1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - b. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers. Retain first paragraph below if applicable.
- B. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.

- C. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 - 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.
- D. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- E. Accessibility Requirements:
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm).
 - 4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
- F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled Drawings to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA designations referenced.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

2.2 HINGES

- A. Hinges: BHMA A156.1: Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Baldwin Hardware Corporation.
 - b. Bommer Industries, Inc.
 - c. Cal-Royal Products, Inc.
 - d. Hager Companies.
 - e. IVES Hardware; an Ingersoll-Rand company.
 - f. Lawrence Hardware Inc.
 - g. McKinney Products Company; an ASSA ABLOY Group company.
 - h. PBB, Inc.
 - i. Stanley Commercial Hardware; Div. of The Stanley Works.

2.3 MECHANICAL LOCKS AND LATCHES

- A. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.
- B. Cylinder Locks: BHMA A156.2; Grade 1; Series 4000, with removable cylinders cores.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group Company.

2.4 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from stainless steel, or nickel silver.
 1. Manufacturer: Same manufacturer as for locking devices.
- B. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.5 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
 - 1. Consult owner for keying system.
- B. Keys:
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: Information to be furnished by Owner.
 - b. Material: Match existing
 - 2. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.
 - c. Grand Master Keys: Five.
 - d. Great-Grand Master Keys: Five.

2.6 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; aluminum, unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Burns Manufacturing Incorporated.
 - b. Don-Jo Mfg., Inc.
 - c. Forms + Surfaces.
 - d. Hager Companies.
 - e. Hiawatha, Inc.
 - f. IVES Hardware; an Ingersoll-Rand company.
 - g. Rockwood Manufacturing Company.
 - h. Trimco.

2.7 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arrow USA; an ASSA ABLOY Group company.
 - b. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
 - c. DORMA Architectural Hardware; Member of The DORMA Group North America.

- d. Dor-O-Matic; an Ingersoll-Rand company.
- e. LCN Closers; an Ingersoll-Rand company.
- f. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
- g. Yale Security Inc.; an ASSA ABLOY Group company.

2.8 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16; aluminum base metal.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Baldwin Hardware Corporation.
 - b. Door Controls International, Inc.
 - c. Hager Companies.
 - d. IVES Hardware; an Ingersoll-Rand company.
 - e. Stanley Commercial Hardware; Div. of The Stanley Works.
 - f. Trimco.

B. Overhead Door Holders and Stops

1. Manufacturers: Subject to compliance with requirements, provide products by the following manufacturer or approved equal:
 - a. Hager Companies
2. Basis of Design: Hager Series 7000 Heavy Duty Surface Mounted Overhead Door Holder and Stop, Model 7000 – SZ2.

2.9 METAL PROTECTIVE TRIM UNITS

A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- (1.3-mm-) thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Baldwin Hardware Corporation.
 - b. Burns Manufacturing Incorporated.
 - c. Don-Jo Mfg., Inc.
 - d. Hiawatha, Inc.
 - e. IPC Door and Wall Protection Systems, Inc.; Div. of InPro Corporation.
 - f. IVES Hardware; an Ingersoll-Rand company.
 - g. Pawling Corporation.
 - h. Rockwood Manufacturing Company.
 - i. Trimco.

2.10 MANUAL FLUSH BOLTS

- A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adams Rite, Inc.
 - b. Burns Manufacturing Incorporated.
 - c. Don-Jo Mfg., Inc.
 - d. Hiawatha, Inc.
 - e. Trimco.

2.11 DOOR GASKETING (WEATHERSTRIPPING)

- A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer, surface mounted.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hagar Companies.
 - b. National Guard Products.
 - c. Pemko Manufacturing Company.
 - d. Reese Enterprises, Inc.
 - e. Zero International, Inc.
- B. Maximum Air Leakage: When tested according to ASTM E 283 with tested pressure differential of 0.3-inch wg (75 Pa), as follows:
 - 1. Gasketing on Single Doors: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.
 - 2. Gasketing on Double Doors: 0.50 cfm per foot (0.000774 cu. m/s per m) of door opening.

2.12 ELECTRIC STRIKES

- A. Electric Strikes: BHMA A156.31; Grade 1, with faceplate to suit lock and frame.
 - 1. Subject to compliance with the requirements of this specification section, the basis of design is HES, an Assa Abloy Company, 1600 Series, electric strike.
 - 2. Coordinate installation with Owner's security vendor for a complete installation.

2.13 ELECTROMAGNETIC LOCKS

- A. Electromagnetic Locks: BHMA A156.23; electrically powered; with electromagnet attached to frame and armature plate attached to door; full-exterior or full-interior type, as required by

application indicated. Furnish all power supplies, accessories and equipment as required for a complete installation.

- B. Coordinate with the Owner's security vendor for a complete installation.

2.14 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hagar Companies.
 - b. National Guard Products.
 - c. Pemko Manufacturing Company.
 - d. Reese Enterprises, Inc.
 - e. Zero International, Inc.

2.15 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release.
- B. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.
- C. Astragals: BHMA A156.22.

2.16 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames
 - 2) Strike plates to frames.

- 3) Closers to doors and frames.
- b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
- 3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
- 4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.17 FINISHES

- A. Provide finishes complying with BHMA A156.18 – 626 Satin Chromium plated (US26D).
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
- C. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 - 1. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- D. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- E. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

- F. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as directed by Owner.
 - 2. Furnish permanent cores to Owner for installation.
- G. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- H. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- I. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.2 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

END OF SECTION 087100

SECTION 088000 - GLAZING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Laminated glass for safety glass in interior windows and storefront
 - 2. Impact rated double insulated glass for exterior storefront windows.

1.2 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.

1.3 QUALITY ASSURANCE

- A. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

PART 2 - PRODUCTS**2.1 GLASS PRODUCTS**

- A. Float Glass: ASTM C 1036, Type I, Quality-Q4, Class I (clear) unless otherwise indicated.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. AFG Industries, Inc.
 - b. Guardian Industries Corp.
 - c. Pilkington North America.
 - d. PPG Industries, Inc.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q4; Class I (clear) unless otherwise indicated; of kind and condition indicated.
- C. Sealed Insulating Glass Units:
 - A. General: Provide the following types of exterior large missile impact glass assemblies as indicated on the Contract Drawings and Finish Schedules:
 - 1. 1" insulating laminated glass unit consisting of the following:

- a. Outside Lite: 1/4" thick tempered, PPG Solargray, color to match existing.
- b. Air Space: 1/2".
- c. Inside Lite: 1/4" clear laminated glass, laminated glass unit shall consist of two heat strengthened lites laminated with 0.090" clear PVB interlayer.

2.2 LAMINATED GLASS

- A. General: Refer to primary and heat-treated glass requirements for properties of uncoated glasses making up laminated glass.
- B. Laminating Process: Fabricate laminated glass using laminator's standard process to produce glass free from defects.

2.3 GLAZING SEALANT, GASKETS, AND TAPES FOR EXTERIOR WINDOWS

- A. 1-Part Silicone Rubber Glazing Sealant: Elastomeric silicone sealant complying with FS TT-S- 001543, Class A, non-sag. Provide acid type recommended by manufacturer where only nonporous bond surfaces are contacted; provide nonacid type recommended by manufacturer where one or more porous bond surfaces are contacted.
- B. Dense Gaskets: Extruded one piece gaskets of silicone complying with ASTM C 1115, of profile required to maintain watertight seal, with a Shore hardness required to maintain watertight seal.
- C. Cellular Gaskets: Extruded one piece closed cell, integral-skinned neoprene gaskets of profile required to maintain watertight seal; complying with ASTM C 509, with a Shore A hardness of 40 + 5, to provide 20 to 35% compression.
- D. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

2.4 SEALING TAPES FOR EXTERIOR WINDOWS

- A. Sealing Tapes: Dow silicone caulk and silicone formed tapes and neoprene setting block, etc.

2.5 GLAZING GASKETS FOR INTERIOR WINDOWS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
 - 1. Neoprene complying with ASTM C 864.
 - 2. EPDM complying with ASTM C 864.
 - 3. Silicone complying with ASTM C 1115.
 - 4. Thermoplastic polyolefin rubber complying with ASTM C 1115.
- B. General:
 - 1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units,

and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

2.6 GLAZING TAPES – INTERIOR WINDOWS

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.4 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Apply heel bead of elastomeric sealant.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers

and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.4 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 088000

088100 - METAL WINDOW PANELS

PART 1 - GENERAL

1.01 – Scope

1. The basis of design for Metal Window Panels is Mapes Architectural Panels, LLC, Lincoln, NE, "R" Panels. Panels consist of metal skins laminated to stabilizer substrates with an insulating core material. Panels shall be designed to be glazed into a storefront window system.
2. Related Work
 1. Section 084100 – Aluminum Entrances and Storefront
 2. Section 09200 - Interior Wall Finish

1.02 - Quality Assurance

1. Field measurements shall be taken prior to completion of manufacturing and cutting.
2. Maximum deviation from vertical and horizontal alignment of installed panels is 1/8" (3mm) in 20' (6m) non-commutative.

1.03 - References

1. American Society of Testing Materials (ASTM)
 - A. E330-84: Structural Performance of Exterior Windows, Curtain Walls and Doors under the influence of wind loads.
 - B. D1781-76: Climbing Drum Peel Test for Adhesives.
 - C. D3363-74: Method for Film Hardness by Pencil Test.
 - D. D2794-90: Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
 - E. D3359-90: Method for Measuring Adhesion by the tape test.

1.04 - Substitutions

1. The materials and products specified in this section establish a minimum standard of required function, design, appearance quality and warranty to be met by any proposed substitution.
2. No substitutions will be considered unless a written request for approval has been submitted by the bidder and received by the architect 10 days prior to the bid date.

1.05 - Submittals

1. Samples:
 - A. Panel makeup - 2 samples - 10"x10"
 - B. Two samples of each color and finish texture - 3"x5"
2. Submission Drawings: Indicate thickness, dimension and components of parts. Detail glazing methods, framing and tolerances to accommodate thermal movement.
3. Affidavit certifying materials meet all requirements as specified.

1.06 - Delivery, Storage and Handling

1. Protect finish and edge in accordance with panel manufacturer's recommendations.
2. Store materials in accordance with panel manufacturer's recommendations.

PART 2 - PRODUCTS

2.01 - Panels - Laminated

1. Laminated metal faced Mapes-R panels as manufactured by Mapes Industries, Inc., basis of design.

2.02 - Finish

1. Finishes
2. Exterior: Standard Kynar
3. Interior: Standard Kynar
4. Color as selected by architect.

2.03 - Panel Fabrication

1. Exterior Substrate: Tempered Hardboard
2. Core: Isocyanurate
3. Interior Substrate: Tempered Hardboard
4. Tolerances - .8% of panels dimension length and width - (+/-) 1/16" thickness
5. Panel Thickness - 1"
6. R-Value - 6.4
7. U-Value - 0.16

2.04 - Accessories

1. Recommended for use as an infill panel component in window and curtain wall systems. Related material to complete installation as recommended by the manufacturer.
2. Seals against moisture intrusion as recommended by the manufacturer. Polyurethane and silicone based sealant with a 20 year life are recommended.

PART 3 - EXECUTION

3.01 - Installation

1. Panel surfaces shall be free from defects prior to installation.

3.02 - Execution

1. Erect panels plumb, level and true.
2. Glaze panels securely and in accordance with approved shop drawings and manufacturers instructions to allow for necessary thermal movement and structural support.
3. Do not install panels that are observed to be defective including warped, bowed, dented, scratched and delaminating components.
4. Weather seal all joints as required using methods and materials as previously specified.
5. Separate dissimilar metals using gasket fasteners and blocking to eliminate the possibility of electrolytic reaction.

3.03 - Adjusting and Cleaning

1. Remove masking film as soon as possible after installation. Masking intentionally left in place after panel installation will be the responsibility of the contractor.
2. Weep holes and drainage channels must be unobstructed and free from dirt and sealant.

END OF SECTION 088100

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
 - 2. Suspension systems for interior gypsum ceilings and soffits.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide materials and construction identical to those tested according to ASTM E 119.
- B. STC-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413.

2.2 FRAMING SYSTEMS

- A. Steel Studs and Runners: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: As indicated on Drawings
 - 2. Depth: As indicated on Drawings.
- B. Slip-Type Head Joints: Where indicated, provide the following in thickness not less than indicated for studs and in width to accommodate depth of studs:
 - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (51-mm-) deep flanges, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
 - 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (51-mm-) deep flanges and fastened to studs, and outer runner sized to friction fit inside runner.
 - 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes due to deflection of structure above.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.

- 2) MBA Building Supplies; Slotted Deflecto Track.
- 3) Steel Network Inc. (The); VertiClip SLD, VertiTrack VTD Series.
- 4) Superior Metal Trim; Superior Flex Track System (SFT).
- 5) Telling Industries; Vertical Slip Track, Vertical Slip Track II.

C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 16 gauge unless noted otherwise.

D. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: As indicated on Drawings.
2. Depth: As indicated on Drawings

F. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

G. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

H. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.018 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Hanger Attachments to steel:

1. Anchors: Capable of sustaining a load equal to 5 times that imposed as determined by ASTM E 488.
 - a. Type: Postinstalled, expansion anchor.

2. Powder-Actuated Fasteners: Capable of sustaining, a load equal to 10 times that imposed as determined by ASTM E 1190.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch (25 by 5 mm) by length indicated.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.
 1. Depth: As indicated on Drawings

2.4 AUXILIARY MATERIALS

- A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.3 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 3. Do not attach hangers to steel roof deck.
 4. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 5. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Installation Tolerances: Install suspension systems that are level to within 1/8 inch (3 mm) in 12 feet (3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092400 - CEMENT PLASTERING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior vertical plasterwork (stucco).

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of factory-prepared finish coat and for each color and texture specified.

PART 2 - PRODUCTS

2.1 METAL LATH

- A. Expanded-Metal Lath: ASTM C 847, cold-rolled carbon-steel sheet with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized-zinc coating.
 - 1. Diamond-Mesh Lath: Self-furring 3.4 lb/sq. yd.
- B. Paper Backing: FS UU-B-790a, Type I, Grade D, Style 2 vapor-permeable paper.
 - 1. Provide paper-backed lath at exterior locations as indicated on Drawings.

2.2 ACCESSORIES

- A. General: Comply with ASTM C 1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
 - 1. Cornerbeads: With perforated flanges.
 - a. Smallnose cornerbead; use unless otherwise indicated.
 - 2. Casing Beads: With perforated flanges in depth required to suit plaster bases indicated and flange length required to suit applications indicated.
 - a. Square-edge style; use unless otherwise indicated.

3. Control Joints: One-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
4. Expansion Joints: Two-piece type, formed to produce slip-joint and square-edged 1/2-inch wide reveal; with perforated concealed flanges.

2.3 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminants, manufactured for use in cement plaster.
- C. Bonding Compound: ASTM C 932.
- D. Fasteners for Attaching Metal Lath to Substrates: ASTM C 1063.
- E. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter unless otherwise indicated.

2.4 PLASTER MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I.
- B. Plastic Cement: ASTM C 1328.
- C. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- D. Sand Aggregate: ASTM C 897.
 1. Color for Job-Mixed Finish Coats: White
- E. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems formulated with colorfast mineral pigments and fine aggregates; for use over cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
 1. Color: Color shall match existing finish.

2.5 PLASTER MIXES

- A. General: Comply with ASTM C 926 for applications indicated.
 1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials.

- B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:
 - 1. Portland and Plastic Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part plastic cement and 1 part portland cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - b. Brown Coat: For cementitious material, mix 1 part plastic cement and 1 part portland cement. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
- C. Factory-Prepared Finish-Coat Mixes: For ready-mixed acrylic-based finish coatings, comply with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Prepare smooth, solid substrates for plaster according to ASTM C 926.

3.2 INSTALLING METAL LATH

- A. Metal Lath: Install according to ASTM C 1063.

3.3 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
- B. Reinforcement for External (Outside) Corners:
 - 1. Install lath-type, external-corner reinforcement or cornerbead at exterior locations.
 - 2. Install cornerbead at interior locations.
- C. Control Joints: Locate as indicated on Drawings.

3.4 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
- B. Walls; Base-Coat Mixes for Use over Metal Lath: For scratch and brown coats, for three-coat plasterwork with minimum 3/4-inch total thickness, as follows:
 - 1. Portland and plastic cement mixes.
- C. Plaster Finish Coats: Apply to provide finish and texture to match existing finish.

- D. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

3.5 PLASTER REPAIRS

- A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

END OF SECTION 092400

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.

1.2 ACTION SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Gypsum.
 - 2. CertainTeed Corp.
 - 3. Georgia-Pacific Gypsum LLC.

4. Lafarge North America Inc.
5. National Gypsum Company.
6. USG Corporation.

B. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (12.7 mm).
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling

C. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling

D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (12.7 mm).
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling

E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10.

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized steel sheet, plastic, or rolled zinc.

C. Aluminum Trim: ASTM B 221 (ASTM B 221M), Alloy 6063-T5.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

2.5 AUXILIARY MATERIALS

- A. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
- C. Sound Attenuation Blankets: As specified in Division 7 Section "Insulation".
- D. Acoustical Joint Sealant: As specified in Division 7 Section "Penetration Firestopping" and Division 7 Section "Joint Sealants".
- E. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."
- F. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

- A. Comply with ASTM C 840.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- D. Install trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- E. Prefill open joints and damaged surface areas.
- F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 5: At panel surfaces that will be exposed to view unless otherwise indicated
- H. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Porcelain tile.
 - 2. Waterproof membrane.
 - 3. Crack isolation membrane.
 - 4. Metal edge strips.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples:
 - 1. Each type and composition of tile and for each color and finish required.

1.3 EXTRA MATERIALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 TILE PRODUCTS

- A. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. Porcelain Floor Tile Type PFT-1:
 - 1. Manufacturers:
 - a. Coastal Tile "Paramount"
 - 2. Module Size: 6 inch x 36 inch
 - 3. Tile Color and Pattern: As indicated in drawings
 - 4. Grout Color: As selected by Architect from manufacturer's full range

2.2 WATERPROOF MEMBRANE

- A. Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated.

2.3 CRACK ISOLATION MEMBRANE

- A. Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated.

2.4 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bonsal American; an Oldcastle company.
 - b. Bostik, Inc.
 - c. C-Cure.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. Southern Grouts & Mortars, Inc.
 - g. TEC; a subsidiary of H. B. Fuller Company.
 - 2. Prepackaged, dry-mortar mix combined with liquid-latex additive.
 - 3. For wall applications, provide nonsagging mortar.

2.5 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10.
- B. Standard Cement Grout: ANSI A118.6.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bonsal American; an Oldcastle company.
 - b. Bostik, Inc.
 - c. C-Cure.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. Southern Grouts & Mortars, Inc.
 - g. TEC; a subsidiary of H. B. Fuller Company.

2.6 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."

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. Metal Edge Strips: Angle or L-shape, metallic or metal, height to match tile and setting-bed thickness, designed specifically for exterior and interior flooring applications indicated on the drawings; silver stainless-steel, ASTM A 666, 300 Series exposed-edge material.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Blanke Corporation
 - b. Ceramic Tool Company, Inc.
 - c. Schluter Systems L.P.
 - 2. Provide metal edge strips at the following locations, and as indicated in the drawings:
 - a. Exposed edge of tiled floor transition to non-tiled floor.
- C. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
 - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bonsal American, an Oldcastle company; Grout Sealer.
 - b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer
 - c. C-Cure; Penetrating Sealer 978.
 - d. Custom Building Products; Grout and Tile Sealer.
 - e. Jamo Inc.; Penetrating Sealer.
 - f. MAPEI Corporation; KER 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.
 - g. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
 - h. TEC, a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone Grout Sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.
- C. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, pre-coat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA 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 TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - b. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
 - c. Tile floors composed of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. 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. Floor Tile: 1/8 inch
- F. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- G. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
- H. 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.
- I. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- J. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANEL CEILINGS, GENERAL

- A. Acoustical Panel Standard: Comply with ASTM E 1264.
- B. Metal Suspension System Standard: Comply with ASTM C 635.

2.3 ACOUSTICAL PANELS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Armstrong World Industries, Inc.
 - 2. USG Ceilings

- B. Color, style, size, and texture: Basis of Design: Armstrong "Dune" 24" x 24" X 5/8", square lay-in, wet formed mineral fiber with "Bio-Block" mold and mildew protection and "HumiGuard" for humidity and sag resistance, or approved equal.

2.4 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Armstrong World Industries, Inc.
 - 2. USG Ceilings
- B. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; pre-painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation; with prefinished 15/16 inch wide metal caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. End Condition of Cross Runners: Butt-edge type.
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: Steel or aluminum cold-rolled sheet.
 - 5. Cap Finish: Painted white.
- C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.
 - 1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient molding accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each type of product indicated, in manufacturer's standard-size Samples.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

- A. Resilient Base:
 - 1. Manufacturers: Provide the following:
 - a. Johnsonite, Inc.
- B. Height: 4 inches (102 mm).

- C. Lengths: Coils in manufacturer's standard length.
- D. Outside Corners: Job formed.
- E. Inside Corners: Job formed.
- F. Material: Rubber
- G. Colors and Patterns: As indicated in drawings.

2.2 RESILIENT MOLDING ACCESSORY

- A. Resilient Molding Accessory:
 - 1. Manufacturers: Provide products by one of the following.
 - a. Johnsonite, Inc.
- B. Description: Carpet edge for glue-down applications, Reducer strip for resilient floor covering, Joiner for tile and carpet, Transition strips.
- C. Material: Rubber

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Cove Base Adhesives: Not more than 50 g/L.
 - b. Rubber Floor Adhesives: Not more than 60 g/L.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Accessories: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
 4. Moisture Testing: Perform tests recommended by manufacturer.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are same temperature as the space where they are to be installed.
1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.

3.3 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl floor tile.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: Full size samples of each color and pattern of floor tile required. Three (3) samples of each color.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor tile.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 VINYL FLOOR TILE – VT-1

- A. Products: Tandus Centivia "Venue Wood"

- B. Size: 6 by 36 inches
- C. Total Thickness: .120 inches
- D. Edge Treatment: Square edge
- E. Colors and Patterns: as indicated in drawings.

2.2 VINYL FLOOR TILE – VT-2

- A. Products: Tandus Centivia “Venue Stone”
- B. Size: 18 by 18 inches
- C. Total Thickness: .120 inches
- D. Edge Treatment: Square Edge
- E. Colors and Patterns: as indicated in drawings.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
- C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

4. Moisture Testing: Perform tests recommended by floor covering manufacturer. Proceed with installation only after substrates pass testing.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay tiles square with room axis, unless noted otherwise on drawings.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 1. Lay tiles with grain running in one direction.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish per manufacturers recommendations and instructions.

C. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096726-EPOXY QUARTZ FLOORING
(EPOXY BROADCAST WITH URETHANE TOPCOAT)

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes the following:
 - 1. Quartz flooring system as shown on the drawings and in schedules.

1.3 SYSTEM DESCRIPTION

- A. The work shall consist of preparation of the substrate, the furnishing and application of an epoxy based multi roller applied flooring system with Q28 or Q11 colored quartz aggregate and urethane topcoat. The system shall have the color and texture as specified by the Owner with a nominal thickness of 1/8 inch. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.
- B. Cove base to be applied where noted on plans and per manufacturers standard details unless otherwise noted.

1.4 SUBMITTALS

- A. Product Data: Latest edition of Manufacturer's literature including performance data and installation procedures.
- B. Manufacturer's Material Safety Data Sheet (MSDS) for each product being used.
- C. Samples: A3 inch square sample of the proposed system. Color, texture, and thickness shall be representative of overall appearance of finished system.

1.5 QUALITY ASSURANCE

- A. The Manufacturer shall have a minimum of 10 years experience in the production, sales, and technical support of epoxy and urethane industrial flooring and related materials.
- B. The Applicator shall have been approved by the flooring system manufacturer in all phases of surface preparation and application of the product specified.
- C. No requests for substitutions shall be considered that would change the generic type of the specified System.
- D. A pre-installation conference shall be held between Applicator, General Contractor and the Owner to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping

1. All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.

B. Storage and Protection

1. The Applicator shall be provided with a storage area for all components. The area shall be between 60 F and 90 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
2. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.

C. Waste Disposal

1. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

1.7 PROJECT CONDITIONS

A. Site Requirements

1. Application may proceed while air, material and substrate temperatures are between 60 F and 90 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
2. The relative humidity in the specific location of the application shall be less than 85 % and the surface temperature shall be at least 5 F above the dew point.
3. The Applicator shall ensure that adequate ventilation is available for the work area.
4. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.

B. Safety Requirements

1. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.
2. "No Smoking" signs shall be posted at the entrances to the work area.
3. The Owner shall be responsible for the removal of foodstuffs from the work area.
4. Non-related personnel in the work area shall be kept to a minimum.

1.8 WARRANTY

A. Coating System Manufacturer's Material Guarantee

1. Coating System Manufacturer shall provide a project specific material replacement guarantee warranting its products against manufacturing defects for a period of five (5) years from the date of substantial completion. Manufacturer's warranty shall provide for direct replacement of defective product at no cost to the Owner specifically named within the warranty.

B. Contractor's Workmanship Guarantee

1. Contractor shall provide a project specific guarantee against coating system failures resulting from defects in workmanship for a period of five (5) years from the date of substantial completion. Contractor's warranty shall stipulate that the contractor shall provide all installation labor, material, and equipment to repair or replace installed coating systems which fail due to poor workmanship (i.e.: faulty surface preparation, improper application procedures, application outside of acceptable ambient conditions parameters, miscatalyzed resins, etc.) at no cost to the Owner specifically named within the warranty.

PART 2 – PRODUCTS

2.1 FLOORING

- A. Dur-A-Flex, Inc, Dur-A-Quartz, Epoxy-Based seamless flooring system.
1. System Materials:
 - a. Primer: Dur-A-Flex, Inc, Dur-A-Glaze #4 WB resin and hardener.
 - b. Broadcast Coats: Dur-A-Flex, Inc, Dur-A-Glaze #4 resin and hardener.
 - c. The quartz aggregate shall be Dur-A-Flex, Inc. Q-28 colored quartz aggregate.
 - d. Grout Coat: Dur-A-Flex, Inc. Dur-A-Glaze #4 resin and Water Clear hardener.
 - e. Topcoat: Dur-A-Flex, Inc. Armor Top resin, hardener and grit.
 2. Patch Materials
 - a. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Dur-A-Glaze # 4 Cove-Rez.
 - b. Deep Fill and Sloping Material (over ¼ inch): Use Dur-A-Flex, Inc. Duratex #32.

2.2 MANUFACTURER

- A. Dur-A-Flex, Inc., 95 Goodwin Street, East Hartford, CT 06108, Phone: (860) 528-9838, Fax: (860) 528-2802
- B. Manufacturer of Approved System shall be single source and made in the USA.
- C. Approved equal: Tnemec 1/8" Decorative Quartz / Epoxy Laminate with Clear Urethane Topcoat

2.3 PRODUCT REQUIREMENTS

- | | |
|--|-------------------------------|
| A. Primer | Dur-A-Glaze #4 WB |
| 1. Percent Solids | 56 % |
| 2. VOC | 2 g/L |
| 3. Bond Strength to Concrete ASTM D 4541 | 550 psi, substrates fails |
| 4. Hardness, ASTM D 3363 | 3H |
| 5. Elongation, ASTM D 2370 | 9 % |
| 6. Flexibility (1/4: Cylindrical mandrel), ASTM D 1737 | Pass |
| 7. Impact Resistance, MIL D-2794 | >160 |
| 6. Abrasion Resistance ASTM D 4060,
CS 17 wheel, 1,000 g Load | 30 mg loss |
| B. Broadcast, and Grout Coat | Dur-A-Glaze #4 |
| 1. Percent Solids | 100 % |
| 2. VOC | 3.8 g/L |
| 3. Compressive Strength, ASTM D 695 | 17,500 psi |
| 4. Tensile Strength, ASTM D 638 | 2,100 psi |
| 5. Flexural Strength, ASTM D 790 | 5,100 psi |
| 6. Abrasion Resistance, ASTM D 4060
C-10 Wheel, 1,000 gm load, 1,000 cycles | 29 mg loss |
| 7. Flame Spread/NFPA-101, ASTM E 84 | Class A |
| 8. Impact Resistance MIL D-24613
delamination | 0.0007 inches, no cracking or |
| 9. Water Absorption. MIL D-24613 | Nil |

10. Potlife @ 70 F

20 minutes

C. Topcoat	Armor Top
1. Percent Solids	95 %
2. VOC	0 g/L
3. Tensile Strength, ASTM D 2370	7,000 psi
4. Adhesion, ASTM 4541	Substrate Failure
5. Hardness, ASTM D 3363	4H
6. 60° Gloss ASTM D 523	70
7. Abrasion Resistance, ASTM D4060 CS 17 wheel (1,000 g load) 1,000 cycles	Gloss Satin 48 mg loss with grit 10-12 mg loss without grit
8. Pot Life, 70 F, 50% RH	2 Hours
9. Full Chemical Resistance	7 days

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.
 - 1. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

3.2 PREPARATION

- A. General
 - 1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
 - 2. Moisture Testing: Perform tests recommended by manufacturer and as follows.
 - a. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
 - b. If the relative humidity exceeds 75% then Dur-A-Flex, Inc Dur-A-Glaze MVP Primer moisture mitigation system must be installed prior to resinous flooring installation. Slab-on grade substrates without a vapor barrier may also require the moisture mitigation system.
 - 3. There shall be no visible moisture present on the surface at the time of application of the system. Compressed oil-free air and/or a light passing of a propane torch may be used to dry the substrate.
 - 4. Mechanical surface preparation
 - a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 4-5 as described by the International Concrete Repair Institute.
 - b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.

- c. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/4 inch key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
- d. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.
- 5. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

3.3 APPLICATION

A. General

- 1. The system shall be applied in seven distinct steps as listed below:
 - a. Substrate preparation
 - b. Priming
 - c. First broadcast coat application with first aggregate broadcast
 - d. Second broadcast coat with second aggregate broadcast
 - e. Grout coat application, sand floor (if required)
 - f. First topcoat application
 - g. Second topcoat application
- 2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
- 3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
- 4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
- 5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Primer

- 1. The primer shall consist of a liquid resin and hardener that is mixed at the ratio of 1 part resin to 4 parts hardener per the manufacturer's instructions.
- 2. The primer shall be applied by 1/8 inch notched squeegee and back rolled at the rate of 200 sf/gal to yield a dry film thickness of 4 mils.

C. Broadcast Coat

- 1. The broadcast coat shall be applied as a double broadcast system as specified by the Architect.
- 2. The broadcast coat shall be comprised of two components, a resin, and hardener as supplied by the Manufacturer and mixed in the ratio of 2 parts resin to 1 part hardener.
- 3. The resin shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
- 4. The broadcast coat shall be applied over horizontal surfaces using "v" notched squeegee and back rolled at the rate of 90-100 sf/gal.
- 5. Colored quartz aggregate shall be broadcast to excess into the wet material at the rate of 0.5 lbs/sf.
- 6. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.
- 7. Apply a second coat of resin with a coverage rate of 90 sf/gal (Q28) or 50 sf/gal (Q11). and broadcast aggregate to excess at the rate of 0.5 lbs/sf.

8. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.

D. Grout Coat

1. The grout coat shall be comprised of liquid components, combined at a ratio of 2 parts resin to 1 part
2. The grout coat shall be squeegee applied with a coverage rate of 90 sf/gal (Q28) or 50 sf/gal (Q11).
hardener by volume and shall be thoroughly blended by mechanical means such as a high speed paddle mixer.
3. The grout coat will be back rolled and cross rolled to provide a uniform texture and finish.

E. Topcoat

1. The topcoat of product system shall be roller applied at the rate of 500 sf/gal to yield a dry film thickness of 3 mils.
2. The topcoat shall be comprised of a liquid resin, hardener and grit that is mixed per the manufacturer's instructions.
3. The finish floor will have a nominal thickness of 1/8 inch.

3.4 FIELD QUALITY CONTROL

A. Tests, Inspection

1. The following tests shall be conducted by the Applicator:
 - a. Temperature
 1. Air, substrate temperatures and, if applicable, dew point.
 - b. Coverage Rates
 1. Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.5 CLEANING AND PROTECTION

- A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
- B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION 096726

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes modular, carpet tile.

1.2 RELATED SECTIONS

- A. Refer to Section 096513 for Resilient Base.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit EQ 4.3:
 - a. For carpet tile, documentation indicating compliance with testing and product requirements of CRI's "Green Label Plus" program.
 - b. For installation adhesive, documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Credit EQ 4: For carpet and installation adhesives, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Samples: For each exposed product and for each color and texture specified.
- D. Sustainability: Provide the Statement of the Achievement Level the carpet has attained for based on specific Sustainable Attribute Performance for all product stages according to ANSI/NSF 140.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
- B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

1.8 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

1.9 EXTRA MATERIALS

- A. Provide 6% of carpet tiles of each color and pattern selected and furnish verification of total yardage delivered by mill, showing exact amount of overrun. Deliver to Owner all carpet overrun in full tiles, properly wrapped and labeled. Salvage all tiles from installation for Owner's "attic stock".

1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Products: Subject to compliance with requirements, provide the following: As indicated on drawings
- B. Primary Backing/Backcoating: Manufacturer's standard composite materials.
- C. Secondary Backing: Manufacturer's standard material.

- D. Installation Method: As indicated on drawings
- E. Size: As indicated on drawings
- F. Applied Soil-Resistance Treatment: Manufacturer's standard material.
- G. Antimicrobial Treatment: Manufacturer's standard material.
- H. Performance Characteristics: As follows:
 - 1. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D 7330.
 - 2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
 - 3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
 - 4. Tuft Bind: Not less than 3 lbf (13 N according to ASTM D 1335.
 - 5. Delamination: Not less than 3.5 lbf/in. (15 N/mm) according to ASTM D 3936.
 - 6. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
 - 7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
 - 8. Resistance to Insects: Comply with AATCC 24.
 - 9. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
 - 10. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) according to AATCC 16, Option E.
 - 11. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.
 - 12. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.
 - 13. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" program.
Emissions: Provide carpet tile that complies with the product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
 - 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Preparation: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- E. Installation: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- F. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.
- G. Maintain dye lot integrity. Do not mix dye lots in same area.
- H. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- I. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- J. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- K. Install pattern parallel to walls and borders.
- L. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- M. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

END OF SECTION 096813

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Concrete masonry units (CMUs).
 - 2. Steel and iron.
 - 3. Galvanized metal.
 - 4. Portland cement plaster (stucco).

1.2 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. Samples: For each type of paint system and each color and gloss of topcoat.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.
 2. Masonry (Clay and CMUs): 12 percent.
 3. Portland Cement Plaster: 12 percent.

- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

- A. CMU Substrates:
 - 1. Latex over Alkali-Resistant Primer System (MPI EXT 4.2L):
 - a. Prime Coat: Primer, alkali resistant, water based.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4).

B. Steel and Iron Substrates:

1. Alkyd System (MPI EXT 5.1D):
 - a. Prime Coat: Primer, alkyd, anticorrosive, for metal.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5).

C. Galvanized-Metal Substrates:

1. Alkyd System (MPI EXT 5.3)
 - a. Prime Coat: Primer, galvanized.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5).

D. Portland Cement Plaster Substrates:

1. Latex System (MPI EXT 9.1A):
 - a. Prime Coat: Latex, exterior, matching topcoat.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1).

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates.

1.2 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523. (flat)
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523. (eggshell)
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523. (satin)
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523. (semi-gloss)
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523. (gloss)
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523. (high-gloss)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system and in each color and gloss of topcoat.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than [1 gal. (3.8 L)] of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24)].
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.
 - 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 - 5. Pretreatment Wash Primers: 420 g/L.
- D. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Colors: As selected by Architect from manufacturer's full range

2.3 PRIMERS/SEALERS

- A. Primer Sealer, Latex, Interior: MPI #50.
 - 1. Sherwin-Williams Premium Wall and Wood Primer or approved equal.
- B. Primer Sealer, Interior, Institutional Low Odor/VOC: MPI #149.
 - 1. Sherwin-Williams Harmony Wall Primer or approved equal.

2.4 METAL PRIMERS

- A. Primer, Rust-Inhibitive, Water Based: MPI #107.
 - 1. Sherwin-Williams All Surface Enamel Latex Primer or approved equal.
- B. Primer, Galvanized, Water Based: MPI #134.

2.5 WATER-BASED PAINTS

- A. Latex, Interior, (Gloss Level 3): MPI #52.
 - 1. Sherwin-Williams Duration Home Interior Acrylic Latex or approved equal.
- B. Latex, Interior, (Gloss Level 4): MPI #43.
 - 1. Sherwin-Williams Duration Home Interior Acrylic Latex or approved equal.
- C. Latex, Interior, Semi-Gloss, (Gloss Level 5): MPI #54.
 - 1. Sherwin-Williams Duration Home Interior Acrylic Latex or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
 - 1. Latex over Alkyd Primer System:
 - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
 - b. Alkyd, quick dry, for metal, MPI #76.
 - c. Intermediate Coat: Latex, interior, matching topcoat.
- B. Concrete Substrates, Traffic Surfaces:
 - 1. Alkyd Floor Enamel System:
 - a. Prime Coat: Floor enamel, alkyd, matching topcoat.
 - b. Intermediate Coat: Floor enamel, alkyd, matching topcoat.
 - c. Topcoat: Floor enamel, alkyd, semi-gloss.

C. Gypsum Board Substrates:

1. Latex System:

- a. Prime Coat: Primer sealer, latex, interior MPI #50.
- b. Intermediate Coat: Latex, interior, matching topcoat.
- c. Topcoat: Latex, interior, (Gloss Level 3), MPI #52.

2. Institutional Low-Odor/VOC Latex System:

- a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- c. Top coat: Latex, interior, institutional low odor/VOC, (Gloss level 3), MPI #145.

3. Wood Substrates:

1. Satin Finish Latex System:

- a. 1st Coat: S-W Premium Wall & Wood Primer, B28W8111(4.0 mils wet, 1.8 mils dry)
- b. 2nd Coat: S-W ProClassic Waterborne Acrylic Satin, B20 Series
- c. 3rd Coat: S-W ProClassic Waterborne Acrylic Satin, B20 Series (4.0 mils wet, 1.2 mils dry per coat)

END OF SECTION 099123

SECTION 102213 - WIRE MESH PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Heavy-duty wire mesh partitions.
2. Wire mesh ceilings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For units with factory-applied color finishes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Acorn Wire and Iron Works – Model 135 Heavy Duty Wire Mesh Partitions

2.2 MATERIALS

A. Steel Wire: ASTM A 510 (ASTM A 510M).

B. Steel Plates, Channels, Angles, and Bars: ASTM A 36/A 36M.

C. Steel Sheet: Cold-rolled steel sheet, ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

D. Steel Pipe: ASTM A 53/A 53M, Schedule 40, unless another weight is indicated or required by structural loads.

E. Steel Tubing: ASTM A 500/A 500M, cold-formed structural-steel tubing or ASTM A 513, Type 5, mandrel-drawn mechanical tubing.

F. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer, complying with MPI#79.

2.3 HEAVY-DUTY WIRE MESH PARTITIONS

- A. Mesh: 6 gauge steel wire woven into 2-inch (50-mm) diamond mesh.
- B. Vertical and Horizontal Panel Framing: 1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3.2-mm) cold-rolled steel channels; with holes for 3/8-inch- (9.5-mm-) diameter bolts not more than 18 inches o.c.
- C. Horizontal Panel Stiffeners: Two cold-rolled steel channels, 1 by 1/2 by 1/8 inch, bolted or riveted toe to toe through mesh.
- D. Top Capping Bars: 3-by-1-inch steel channels.
- E. Posts for 90-Degree Corners: 1-3/4-by-1-3/4-by-1/8-inch steel angles or tubes, with holes for 3/8-inch- (9.5-mm-) diameter bolts aligning with bolt holes in vertical framing; with 1/4-inch (6.4-mm) steel base plates.
- F. Posts for Other-Than-90-Degree Corners: 2-inch- OD by 1/8-inch steel pipe or round tube, with holes for 3/8-inch- diameter bolts aligning with bolt holes in vertical framing; with 1/4-inch steel base plates.
- G. Line Posts: 3-1/2-by-1-1/4-by-1/8-inch steel channels; with 1/4-inch steel base plates.
- H. Floor Shoes: Metal, not less than 2 inches high; sized to suit vertical framing, drilled for attachment to floor, and with set screws for leveling adjustment.
- I. Swinging Doors: Fabricated from same mesh as partitions, with framing fabricated from 1-1/2-by-3/4-by-1/8-inch steel channels, banded with 1-1/2-by-1/8-inch flat steel bar cover plates on four sides, and with 1/8-inch- thick angle strike bar and cover on strike jamb.
 - 1. Hinges: Full-surface type, 3-1/2-by-3-1/2-inch steel, three per door; bolted, riveted, or welded to door and jamb framing.
 - 2. Cylinder Lock: BHMA Series 4000 Cylinder type with removable core. See 087100 "Door Hardware for additional requirements. Lock operated by key outside and lever inside; mounted in lower section of door.
 - 3. Door Frame: Prep door frame as required for an electric strike. Provide electric strike. Coordinate with security contractor for installation of card reader.
- J. Accessories:
 - 1. Sheet Metal Base: 0.060-inch- thick, steel sheet.
 - 2. Adjustable Filler Panels: 0.060-inch- thick steel sheet, capable of filling openings from 2 to 12 inches.
- K. Finish: Powder-coated finish unless otherwise indicated.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.4 WIRE MESH CEILINGS

- A. Mesh, Framing, and Stiffeners: Fabricated from same mesh and framing as wire mesh partition panels.

- B. Perimeter Partition Supports: 1-1/2-by-1-1/2-by-1/8-inch steel angle, with holes for 1/4-inch-diameter bolts aligned for bolting to top of wire mesh partitions and to sides of wire mesh ceiling panels.
- C. Wall Supports: 1-1/2-by-1-1/2-by-1/8-inch steel angle punched for attachment to wall and wire mesh ceiling panels.
- D. Intermediate Supports: Steel I-beams or rectangular tubes, as recommended by manufacturer.
- E. Intermediate Support Posts: Not allowed.
- F. Finishes: Match adjacent wire mesh partitions.

2.5 FABRICATION

- A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. Furnish bolts, hardware, and accessories required for complete installation with manufacturer's standard finishes.
 - 1. Fabricate wire mesh items to be readily disassembled.
 - 2. Welding: Weld corner joints of framing and grind smooth, leaving no evidence of joint.
- B. Heavy Duty Wire Mesh Partitions: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.
 - 1. Mesh: Securely clinch or weld mesh to framing.
 - 2. Framing: Fabricate framing with mortise and tenon corner construction.
 - a. Provide horizontal stiffeners as indicated or, if not indicated, as required by panel height and as recommended by wire mesh partition manufacturer. Weld horizontal stiffeners to vertical framing.
 - 3. Fabricate wire mesh partitions with 3 to 4 inches of clear space between finished floor and bottom horizontal framing.
 - 4. Fabricate wire mesh partitions with bottom horizontal framing flush with finished floor.
 - 5. Doors: Align bottom of door with bottom of adjacent panels.
 - a. For doors that do not extend full height of partition, provide transom over door, fabricated from same mesh and framing as partition panels.
 - 6. Hardware Preparation: Mortise, reinforce, drill, and tap doors and framing as required to install hardware.
- C. Wire Mesh Ceilings: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.
 - 1. Mesh: Securely clinch or weld mesh to framing.
 - 2. Framing: Fabricate framing with manufacturer's standard corner construction.
 - a. Provide stiffeners as indicated or, if not indicated, as required by panel span and as recommended by wire mesh ceiling manufacturer. Weld stiffeners to framing.

2.6 STEEL AND IRON FINISHES

- A. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- B. Shop Priming: Apply shop primer to uncoated surfaces of wire mesh units unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
- C. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-on powder-coat finish, suitable for use indicated, with a minimum dry film thickness of 2 mils .
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 WIRE MESH PARTITIONS ERECTION

- A. Anchor wire mesh partitions to floor with 3/8-inch diameter post-installed expansion anchors at 12 inches o.c. through anchor clips located at each post and corner. Shim anchor clips as required to achieve level and plumb installation.
- B. Anchor wire mesh partitions to floor with 3/8-inch diameter post-installed expansion anchors at 12 inches o.c. through floor shoes located at each post and corner. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.
- C. Anchor wire mesh partitions to walls at 12 inches o.c. through back corner panel framing.
- D. Secure top capping bars to top framing channels with 1/4-inch diameter "U" bolts spaced not more than 28 inches o.c.
- E. Provide line posts at locations indicated.
- F. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer and as required for stability, extending and fastening members to supporting structure.
- G. Where standard-width wire mesh partition panels do not fill entire length of run, provide adjustable filler panels to fill openings.
- H. Install doors complete with door hardware.

3.2 WIRE MESH CEILINGS ERECTION

- A. Anchor wall support angle to walls at 12 inches o.c.
- B. Attach wire mesh ceiling panels to wall support angles with bolts at 12 inches o.c.

- C. Attach wire mesh ceiling panels to wire mesh partitions with slotted angles bolted to sides of ceiling panels and to top of partitions at 12 inches o.c.
- D. Attach wire mesh ceiling panels to intermediate supports as recommended by manufacturer.

3.3 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

END OF SECTION 102213

SECTION 102238 - OPERABLE PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manually operated, acoustical panel partitions.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design operable panel partitions including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
 - 1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.
 - 2. Acoustical Performance Requirements: Installed operable panel partition assembly, identical to partition tested for STC, tested for NIC according to ASTM E 336, determined by ASTM E 413, and rated for 10 dB less than STC value indicated.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Indicate storage and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.
- C. Samples: For each type of exposed material, finish, covering, or facing indicated.
- D. Delegated-Design Submittal: For operable panel partitions indicated to comply with performance requirements, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinated with each other, based on input from installers of the items involved:
- F. Setting Drawings: For embedded items and cutouts required in other work, including support-beam, mounting-hole template.
- G. Product certificates.

- H. Product test reports.
- I. Field quality-control reports.
- J. Operation and maintenance data.
- K. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to Division 01 Section "Quality Requirements" for testing indicated.
- C. Fire-Test-Response Characteristics: Provide panels with finishes meeting one of the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 2. Fire Growth Contribution: Meeting acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265.
- D. Pre-installation Conference: Conduct conference at Project site .

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Frame: Steel sheet, manufacturer's standard thickness.

- B. Steel Face/Liner Sheets: Tension-veled steel sheet, manufacturer's standard thickness.
- C. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; manufacturer's standard strengths and thicknesses for type of use.

2.2 OPERABLE ACOUSTICAL PANELS

- A. Operable Acoustical Panels: Operable acoustical panel partition system, including panels, seals, finish facing, suspension system, operators, and accessories.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Modernfold Acoustiseal 900 Series- 931 or comparable product by one of the following, or other approved equal:
 - a. Hufcor.
 - b. Moderco Inc.
 - c. Panelfold Inc.
- B. Panel Operation: Manually operated, individual panels.
- C. Panel Construction: Provide top reinforcement as required to support panel from suspension components and provide reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.
- D. Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
- E. STC: Not less than 54.
- F. Panel Closure: Expandable panel with jamb.
- G. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.

2.3 SEALS

- A. General: Provide types of seals indicated that produce operable panel partitions complying with acoustical performance requirements and the following:
 - 1. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.
- B. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.

1. Mechanically Operated for Acoustical Panels: Extension and retraction of bottom seal by operating handle or built-in operating mechanism, with operating range not less than 2 inches (50 mm) between retracted seal and floor finish.

2.4 FINISH FACING

- A. General: Provide finish facings for panels that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant non-staining adhesive as recommended by facing manufacturer's written instructions.
 1. Color/Pattern: Plastic Laminate as selected by architect from manufacturers full range, including wood grains.
 2. Color/Pattern: On three adjacent operable panels, in the center of the opening, provide 4'-0" x panel width porcelain enamel steel, dry erase marker board. Provide with marker tray.
- B. High-Pressure Decorative Laminate: NEMA LD 3, Horizontal grade.
- C. Cap-Trimmed Edges: Protective perimeter-edge trim with tight hairline joints concealing edges of panel and finish facing.
- D. Trimless Edges: Fabricate exposed panel edges so finish facing wraps uninterrupted around panel, covering edge and resulting in an installed partition with facing visible on vertical panel edges, without trim, for minimal sightlines at panel-to-panel joints.

2.5 SUSPENSION SYSTEMS

- A. Suspension Tracks: Steel or aluminum mounted directly to overhead structural support, with adjustable steel hanger rods for overhead support, designed for type of operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch (2.54 mm) between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
- B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.
- C. Track Intersections, Switches, and Accessories: As required for type of operation, storage, track configuration, and layout indicated for operable panel partitions, and compatible with partition assembly specified. Fabricate track intersections and switches from steel or aluminum.
 1. Multidirectional Switches: Adjustable switch configuring track into L, T, or X intersections and allowing panels to be moved in all pass-through, 90-degree change, and cross-over travel direction combinations.
- D. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with ASTM E 557 except as otherwise required by operable panel partition manufacturer's written installation instructions.
- B. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed.
- C. Install panels from marked packages in numbered sequence indicated on Shop Drawings.
- D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.
- E. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

3.2 ADJUSTING

- A. Adjust operable panel partitions to operate smoothly, without warping or binding. Lubricate hardware and other moving parts.
- B. Adjust pass doors and storage pocket doors to operate smoothly and easily, without binding or warping. Check and readjust operating hardware. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.3 FIELD QUALITY CONTROL

- A. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and bottom seals for voids; adjust partitions for acceptable fit.
- B. NIC Testing: Engage a qualified testing agency to perform tests and inspections.
- C. Testing Methodology: Perform testing of installed operable panel partition for noise isolation according to ASTM E 336, determined by ASTM E 413, and rated for not less than NIC indicated. Adjust and fit partitions to comply with NIC test method requirements.
- D. Testing Extent: Testing agency shall randomly select one operable panel partition installation(s) for testing.
- E. Repair or replace operable panel partitions that do not comply with requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of repaired, replaced, or additional work with specified requirements.
- G. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

END OF SECTION 102238

SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Corner guards.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed product and for each color and texture specified, 12 inches (300 mm) long.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Surface-Burning Characteristics: As determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.

1.5 MATERIALS

- A. PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout.
 - 1. Impact Resistance: Minimum 25.4 ft-lbf/in. (1356 J/m) of notch when tested according to ASTM D 256, Test Method A.
 - 2. Chemical and Stain Resistance: Tested according to ASTM D 543
 - 3. Self-extinguishing when tested according to ASTM D 635.
 - 4. Flame-Spread Index: 25 or less.
 - 5. Smoke-Developed Index: 450 or less.
- B. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in ASTM B 221 (ASTM B 221M) for Alloy 6063-T5.

- C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- D. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1.6 CORNER GUARDS

- A. Surface-Mounted, Resilient, Plastic Corner Guards: Assembly consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
 - 1. Manufacturers:
 - a. Construction Specialties, Inc: SM-20N
 - 2. Cover: Extruded rigid plastic, minimum 0.100-inch wall thickness; in dimensions and profiles indicated on Drawings.
 - a. Color and Texture: As indicated on drawings
 - 3. Retainer: Minimum 0.060-inch- (1.5-mm-) thick, one-piece, extruded aluminum
 - 4. Retainer Clips: Manufacturer's standard impact-absorbing clips.
 - 5. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

PART 2 - EXECUTION

2.1 INSTALLATION

- A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
 - 1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.
 - 2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
 - a. Provide anchoring devices to withstand imposed loads.
 - b. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (305 mm).
 - c. Adjust end and top caps as required to ensure tight seams.

- B. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.
- C. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 102800 – TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Underlavatory guards.
 - 3. Custodial Accessories
- B. Owner-Furnished Material:
 - 1. Soap dispenser
 - 2. Paper towel dispenser
 - 3. Toilet tissue dispenser

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.3 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PUBLIC-USE WASHROOM ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. A & J Washroom Accessories, Inc.
 - 2. American Specialties, Inc.
 - 3. Bobrick Washroom Equipment, Inc.

4. Bradley Corporation.

B. Grab Bar:

1. Mounting: Flanges with concealed fasteners.
2. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
 - a. Finish: Smooth, No. 4 finish (satin).
3. Outside Diameter: 1-1/2 inches (38 mm).
4. Configuration and Length: As indicated on Drawings.

C. Mirror Unit:

1. Frame: Stainless steel channel.
 - a. Corners: Welded and ground smooth.
2. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
3. Size: As indicated on Drawings.

2.2 UNDERLAVATORY GUARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

B. Underlavatory Guard:

1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded plastic, white.

2.3 CUSTODIAL ACCESSORIES

A. Utility Shelf:

1. Description: With exposed edges turned down not less than 1/2 inch (13 mm) and supported by two triangular brackets welded to shelf underside.
2. Size: As indicated on drawings.
3. Material and Finish: Not less than nominal 0.05-inch- (1.3-mm-) thick stainless steel, No. 4 finish (satin).

B. Mop and Broom Holder:

1. Description: Unit with shelf, hooks, and holders suspended beneath shelf.
2. Length: As indicated on drawings.

3. Hooks: Four.
4. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
5. Material and Finish: Stainless steel, No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch- (1.3-mm-) thick stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

END OF SECTION 102800

SECTION 105220 - FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide portable fire extinguishers and cabinets.

1.02 SUBMITTALS

- A. Submit for approval shop drawings, product data.

1.03 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions. Provide certification tag for each fire extinguisher in accordance with requirements of the State Fire Marshall.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fire extinguishers: UL listed and labeled units; Larsen's Manufacturing Company or approved equal:
 - 1. Multi-purpose dry chemical type; UL rating 4A-60B: C. 10lb capacity.
 - 2. Mounting Brackets: Manufacturer's standard steel designed to secure fire extinguishers to a wall or structure, in sizes required for types and capacities of fire extinguishers indicated, with plated red baked enamel finish.
 - 3. Identification: Lettering complying with the authorities having jurisdiction for letter style, size, spacing and location. Locate above the extinguisher. Identify with the words "FIRE EXTINGUISHER" in red letter decals applied to the mounting surface.
- B. Cabinets: Enameled steel box with trim, frame, door, and accessories; Larsen's Manufacturing Company or approved equal:
 - 1. Mounting:
 - a) Semi-recessed mounting.

EC SoE WAREHOUSE RENOVATION

2. Trim:
 - a) Exposed trim, 2 ½" rolled edge.
3. Door and trim material
 - a) Aluminum, clear anodized finish.
4. Door style:
 - a) Vertical Duo-panel.
5. Identification:
 - a) Vinyl lettering applied to cabinet door: "FIRE EXTINGUISHER".

- C. Extinguishers: Provide one 10 lb. ABC dry chemical extinguisher per cabinet.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide fire extinguisher and cabinet where indicated on plans as "FEC". Install cabinets plumb and level at maximum 54" to top of extinguisher.
- B. Provide fire extinguisher and wall-hung bracket where indicated on plans as "FE". Install brackets at maximum 54" to top of extinguisher.
- C. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- D. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

END OF SECTION

SECTION 125000 – MANUAL ROLLER SHADES

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide window coverings at all exterior glazing.
 - 1. Manually operated Roller Shades.
 - 2. Related work includes the following:
 - a. Section 06100: Rough Carpentry
 - b. Section 08520: Aluminum Windows

1.02 REFERENCES

- A. National Fire Protection Association (NFPA) 701
- B. Department of Transportation Motor Vehicle Safety Standard 302 Flammability of Interior Materials
- C. California Administrative Code Title 19
- D. Federal Standard 191 Method 5903 (used by Port Authority of New York and New Jersey for drapery, curtain, and upholstery material)

1.03 SUBMITTALS

- A. Subject under provisions of Section 01330 – Submittal Procedures
- B. Product Data: Manufacturer's data sheets shall be submitted for each product specified, including:
 - 1. Preparation instructions and recommendations
 - 2. Finishes, material descriptions, dimensions of individual components
 - 3. Construction and installation instructions
 - 4. Manufacturers recommendations for maintenance and cleaning
- C. Drawings and Diagrams: Product details, installation details, working and assembly drawings shall be supplied as requested.
- D. Sample: Responsible contracting officer or agent shall supply one sample shade of each type specified in this contract for approval. Supplied units shall be furnished complete with all required components, mounting and associated hardware, instructions and warranty.

1.04 QUALITY ASSURANCE

- A. Supplier: Manufacturer, subsidiary or licensed agent shall be approved to supply the products specified, and to honor any claims against product presented in accordance with warranty.

- B. Installer: Installer or agent shall be qualified to install specified products by prior experience, demonstrated performance and acceptance of requirements of manufacturer, subsidiary, or licensed agent. Installer shall be responsible for an acceptable installation.
- C. Uniformity: Provide Manual Roller Shades of only one manufacturer for entire project.
- D. Mock up: Provide (1) mock-up shade for each roller shade type/assembly specified.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Product shall be delivered to site in manufacturer's original packaging.
- B. Product shall be handled and stored to prevent damage to materials, finishes and operating mechanisms.

1.6 JOB CONDITIONS

- A. Prior to shade installation, building shall be enclosed.
- B. Interior temperature shall be maintained between 60° F. and 90° F. during and after installation; relative humidity shall not exceed 80%. Wet work shall be complete and dry.

1.7 WARRANTY

- A. Lifetime Limited Warranty. Fabrics warranted for 5 years. Specific product warranties available from manufacturer or its authorized agent.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

- A. Hunter Douglas Contract/ 13915 Danielson St., Ste.100/ Poway, CA 92064/ Phone: 800-727-8953 Fax: 800-205-9819/ Website: www.hunterdouglascontract.com, or architect approved equivalent.
- B. Request for substitutions must be approved by architect minimum of 10 days prior to close of bid.

2.02 MANUAL ROLLER SHADES

- A. PRODUCT: Hunter Douglas Contract "RB 500 Manual Roller Shades"
- B. MATERIALS:
 - 1. FABRICS: Inherently anti-static, flame retardant, fade and stain resistant, light filtering, room darkening, & blackout fabrics providing 0% - 14% openness factors. Fabric weights to range between 6.00 oz/sq. yd. – 20.70 oz/sq. yd., containing fiberglass, PVC, polyester, acrylic, vinyl laminates, cotton, & vinyl coatings. Finish selected by architect from manufacturer's available contract colors.

2. CONTROL SYSTEMS:

A. CLUTCH OPERATED: Engineered heavy duty chain drive pulley operating system consisting of metal clutch housing and locking plug containing minimum 6 ribs and inserted at minimum of 2-1/4" into roller tube. Lift torque enhancement provided by Counter Balance System with integrated spring support module. Utilization of adjustment-free continuous qualified T304 stainless steel ball chain with 110 lbs. breaking strength for precise control, smooth operation and ensuring a uniform look. Chain tensioner to be compliant with WCMA safety standard A100.1-2010 and must prevent the clutch system from moving the roller shade through lowering and raising if not properly installed as specified in ANSI Standard Section 6.5.2. Components will be maintenance free from adjustments or lubrication for trouble-free operation.

3. ROLLER TUBE: Circular-shaped aluminum tube extruded from alloy and temper 6063 T-6. 2" outside diameter extruded tube to have a .063" wall thickness (2.5" outside diameter to have a .079" wall thickness). Heavily reinforced with minimum six internal ribs providing additional tensile strength and allows for secure placement of clutch & end plug.
4. HEAVY DUTY TUBE BEARING PLUG: Die cast metal and reinforced idler assembly containing spring loaded end plug with positive locking wheel allows for up to 7/8" adjustment and provides for a secure installation and removal of shade. Locking tube bearing plug contains minimum 6 ribs and inserted a minimum of 2-3/8" into roller tube.
5. BOTTOM BAR: Extruded aluminum weight in a Sealed Pocket Hem Bar, or RB Bottom Bar for fabrics that are not seamable. Bottom bar is for tracking adjustments and provides uniform look.
6. MOUNTING HARDWARE: Manufacturer's standard heavy duty bracket constructed of hardened 1/8" thick steel to support full weight of shade with bracket & screw hole covers to provide uniform look. Integrated leveling device for enhanced level adjustment of overall shade. Locking mechanism on bracket adapter provides for a secure installation and removal of the shade.
7. FASCIA: L shape removable aluminum extrusion valance that attaches to brackets and conceals roller shade.
8. ROLLER SHADE POCKET: Extruded aluminum alloy U shape housing for recessed mounting in acoustical tile or drywall ceilings. 5.25" (or 9") in diameter with aluminum closure mount.
9. BLOCKOUT SYSTEM: Extruded aluminum side channel with concealed mounting brackets. Bottom bar with nylon wool pile to prevent light leakage.
10. ADDITIONAL AVAILABLE OPTIONS: RB500 Bottom Bar, Reverse Roll, Detachable Spline, Internal Auto Stop Mechanism, Coupled and Banded

2.03 FABRICATION

- A. Shade measurements shall be accurate to within $\pm 1/8"$ or as recommended in writing by manufacturer.

2.04 FABRICS

- A. FABRIC

1. M Screen 8505

PART 3 - EXECUTION

3.01 INSPECTION:

- A. Subcontractor shall be responsible for inspection on site, approval of mounting surfaces, installation conditions and field measurement for this work.
- B. Other interacting trades shall receive drawings of shade systems, dimensions, assembly and installation methods from subcontractor upon request.

3.02 INSTALLATION:

- A. Installation shall comply with manufacturer's specifications, standards and procedures as detailed on contract drawings.
- B. Adequate clearance shall be provided to permit unencumbered operation of shade and hardware.
- C. Clean finish installation of dirt and finger marks. Leave work area clean and free of debris.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Take field measurements prior to fabrication to ensure fit. Roller Shades shall fill window openings completely between jambs and between head and sill.
- B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- C. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

END OF SECTION

SECTION 15100 – MECHANICAL GENERAL REQUIREMENTS

PART 1 – GENERAL

1.1 CONDITIONS AND REQUIREMENTS

- A. The General Conditions, Supplementary Conditions, and Division-1, General Requirements apply to this section.

1.2 GENERAL PROVISIONS

- A. The contract drawings indicate the extent and general arrangement of the work. The Contractor shall be responsible for installing the proposed systems as indicated, without violation of applicable codes, standards, or specification requirements. The Contractor is also responsible for coordinating the installation and operation of these systems with the other sections of this specification to provide a complete and operable system. Equipment, piping, and ductwork arrangements shall fit the space as indicated and shall allow adequate and approved clearance for entry, servicing and maintenance. Detailed drawings of any proposed departures due to actual field conditions shall be submitted to the Architect for approval. All work shall conform to the requirements of the referenced publications and as specified herein.

1.3 CONFORMANCE WITH AGENCY REQUIREMENTS

- A. Where materials or equipment are specified to conform to requirements of the Underwriters' Laboratories, Inc., Factory Mutual Systems, Air Conditioning and Refrigeration Institute, Air Diffusion Council, American Society of Heating, Refrigerating and Air Conditioning Engineers, or the Air Moving and Conditioning Association, Inc., the Contractor shall submit proof of such conformance. The label or listing of the specified agency will be acceptable evidence. In lieu of the label or listing, the Contractor may submit a written certificate from any approved, nationally recognized testing organization adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the requirements, including methods of testing, of the specified agency. Where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code, the design, fabrication, and installation shall conform to the code in every respect.

- B. Applicable Codes and Standards

Florida Building Code (2017)
Florida Mechanical Code (2017)
Florida Plumbing Code (2017)
Florida Fuel Gas Code (2017)
ASHRAE 90.1 – 2013
SMACNA Standards for Duct Construction
NFPA 90A (2015 ed.) – Installation of Air Conditioning and Ventilating Systems

1.4 CAPACITIES

- A. Capacities of all equipment and material shall be not less than those indicated, nor exceed

maximum values shown on the drawings. Physical dimensions of equipment shall be verified against contract documents to insure manufacturer's maintenance space of available.

1.5 EQUIPMENT INSTALLATION

- A. Necessary supports shall be provided for equipment, appurtenances, pipe, and ductwork as required. Isolation vibration units shall be provided to minimize the intensity of vibration transmission to the building structure where required.

1.6 ELECTRICAL WORK

- A. Electric-motor-driven equipment specified herein shall be provided complete with motors and controls. Electric equipment and wiring shall be in accordance with Division 16000, "Electrical Work". Electrical characteristics shall be as indicated. Each motor shall be of sufficient capacity to drive the equipment at the specified capacity without exceeding the nameplate rating of motor when operating at proper electrical system voltage. Manual or automatic control and protective or signal devices required for the operation herein specified and any control wiring required for controls and devices, but not shown on the electrical plans, shall be provided under this section.

1.7 APPROVAL OF MATERIALS AND EQUIPMENT

- A. After notice to proceed and before purchasing, the Contractor shall submit to the Architect for approval, in five bound copies, a list of materials he proposes for the work. Items to be submitted include, but are not limited to, the items listed in each individual section. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's names, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable industry, and technical society publication references, and other information necessary to establish contract compliance of each item the Contractor proposes to furnish.
 1. Shop Drawings: Drawings shall be a minimum of 8 1/2" x 11" in size, except as specified otherwise.
 2. Manufacturer's Data: Submittals for each manufactured item shall be manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts. All equipment selections shall be clearly marked with name designations shown on drawings (i.e., AHU-1, HPU-2, etc.).
 3. Delivery and Storage: Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Architect. Damaged or defective items, in the opinion of the Architect, shall be replaced.
 4. Cataloged Products: Materials and equipment shall be cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest design that complies with the specification requirements. Materials and equipment shall duplicate items that have been in satisfactory commercial or industrial use at least 2 years prior to bid opening. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the items need not be the products of the same manufacturer.

1.8 NAMEPLATES

- A. Each major item of equipment shall have the manufacturer's name, address, serial and model numbers on a plate securely attached to the item.

1.9 VERIFICATION OF DIMENSIONS

- A. The Contractor shall visit the premises to thoroughly familiarize himself with all details of the work and working conditions and verify all dimensions in the field, and shall advise the Architect of any discrepancy before performing any work. The Contractor shall be specifically responsible for the coordination and proper relation of his work to the building structure and to the work of all trades.

1.10 DRAWINGS

- A. Because of the scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that are required. The Contractor shall carefully investigate the structural and finish conditions affecting his work and he shall furnish fittings, offsets, transitions, unions, etc., as may be required to meet such conditions at no additional cost to the Owner.

1.11 CUTTING AND REPAIRING

- A. The work shall be carefully laid out in advance and no excessive cutting of construction will be permitted. Damage to building, piping, wiring, or equipment as a result of cutting for installation shall be repaired by mechanics skilled in the trade involved at no additional expense to the Owner.

1.12 SAFETY REQUIREMENTS

- A. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts located so that any person can come in close proximity thereto shall be fully enclosed or properly guarded. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation of a type as specified herein. Items such as catwalks, ladders, and guard rails shall be provided where required for safe operation and maintenance of equipment.

1.13 MANUFACTURER'S RECOMMENDATIONS

- A. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Architect prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

1.14 PAINTING

- A. At the completion of all work, all equipment on this project shall be checked for damage, and

any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal or especially covered areas that have been deformed shall be replaced with new material and repainted to match adjacent areas. Painting of new work shall be as specified herein.

1.15 FINAL CLEANUP

- A. At the completion of all work, all equipment on the project shall be checked and thoroughly cleaned, including coils, plenums, under equipment, and any and all other areas around or in equipment. Any filters used during construction shall be replaced with new filters during final cleanup.

1.16 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Bound Instructions: Three (3) complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Architect before the contract is completed. Each set shall be permanently bound and shall have a hard cover. The following identification shall be inscribed on the covers: The words "Operating and Maintenance Instructions", the name and location of the building, the name of the Contractor and the contract number. Flysheet shall be placed before instructions covering each subject. The instruction sheet shall be approximately 8 1/2" x 11", with large sheets of drawings folded in. The instructions shall include, but shall not be limited to, the following:
 - 1. Approved wiring and control diagrams, with data to explain the detailed operation and control of each component.
 - 2. A control sequence describing start-up, operation and shutdown.
 - 3. Operating and maintenance instructions for each piece of equipment, including lubrication instructions.
 - 4. Manufacturer's bulletins, cuts and descriptive data.
 - 5. Parts lists and recommended spare parts.
- B. Framed Instructions: Approved wiring and control diagrams showing the complete layout of the entire system, including equipment, piping, valves and control sequence, framed under glass or in approved laminated plastic, shall be posted, where directed. In addition, condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form framed as specified above for the wiring and control diagrams and posted beside the diagram. Proposed diagrams, instructions, and other sheets shall be submitted prior to posting. The framed instructions shall be posted before acceptance-testing of the system.

END OF SECTION

SECTION 15200 - TESTING AND BALANCING AIR DISTRIBUTION SYSTEMS

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

- A. The General Conditions, Supplementary Conditions and Division 1, General Requirements, apply.
- B. Reference Section 15100 – Mechanical General Requirements.

1.2 QUALITY ASSURANCE

- A. Testing Agency:
 - 1. Submit name, address, and qualifications of testing agency to Architect for approval prior to start of testing.
 - 2. All system adjustments, test and balances are to be performed by a company regularly and exclusively engaged in this work. Agency shall be a member in good standing of the Associates Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB).
 - 3. Procedures shall be as outlined in the AABC Publication 716 (latest edition) for total system balance.

1.3 SUBMITTALS

- A. Test Reports: After completion, submit three (3) certified copies of test and balance report to the Architect for review and as a project record document.

1.4 JOB CONDITIONS

- A. Commencement of Test: Do not begin balancing until the systems have been completed and are in full working order, or at the direction of the Architect, place any part thereof in operation for the purpose of balancing.
- B. Plans and Data: Furnish the balance agency one (1) complete set of all approved up-to-date mechanical plans and shop drawings of all cooling, heating, and air distribution equipment.

1.5 FIELD QUALITY CONTROL

- A. Performance Data: Record the following data and submit to the Architect.
 - 1. Leak test all duct systems and submit results to Architect. Testing procedure shall conform to AABC or NEBB and leakage rate shall not exceed their recommendations.
 - 2. Air Volumes and Velocities: Determine and tabulate at each grille, diffuser, louver, outside air intake, etc., and adjust dampers, control devices and fan drives to obtain the indicated air quantities. Adjust or modify each supply grille and diffuser distribution pattern as required to maintain air motion, noise level and temperature variations within acceptable limits throughout each space. Clearly and permanently mark all dampers at final setting for

reported air balance.

3. System Component Capacity: Record and calculate all data necessary to demonstrate capacity under actual operating conditions, and adjust dampers, valves, control valves and machine drives to obtain a suitable operating balance for each system. Record data for each item of equipment simultaneously with data from all associated equipment together with coincident outside air dry bulb temperatures to permit evaluation of total system performance. Data to include the following:
 - a. Supply, return and outside air quantities for each air conditioning and ventilation system.
 - b. Air volumes and velocities for each fan, cooling coil and air cleaning assembly.
 - c. Entering and leaving air dry bulb and wet bulb temperature for each cooling and heating coil. Leaving dew point for each cooling coil.
 - d. Static pressures for all air handling units and major fans.
 - e. Actual voltage and current input for each motor.
 - f. Test and adjust each diffuser grille, and register within 10 percent of design requirements. Test and record temperature rise, voltage, and current across duct heaters.
4. In readings and test diffusers, grilles and registers include required fpm velocity and test fpm velocity, and required cfm and test cfm after adjustments.

1.6 TEMPERATURE CONTROLS

- A. Set adjustments of all controllers to operate as indicated. Make four hour temperature traverse of each area or zone. Provide testing agency personnel with instruments to verify reports to Architect.

1.7 FINAL TEST

- A. At conclusion of testing agency's work, demonstrate to the Architect that the equipment is mechanically sound, that the systems deliver the rated output without objectionable noise, distress or vibration, and that the temperature controls are functioning properly.

END OF SECTION

SECTION 15400 - PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provision of the Contract, including General and Supplementary Conditions and Division 1 specification sections apply to work specified in this section.
- B. Reference Section 15100 "General Requirements for Mechanical Work" for contractor qualifications.

1.2 SCOPE OF WORK

- A. These specifications and the accompanying drawings are intended to provide for all labor and materials necessary for the installation of complete workable systems as specified herein or indicated on the drawings. The work required under this section of the specification shall include specifically, but is not limited to the following:
- B. A system of potable cold water piping for domestic use including connections to plumbing fixtures and equipment as shown or indicated on the drawings.
- C. A system of potable hot water piping for domestic use including connections to plumbing fixtures and equipment as shown or indicated on the drawings.
- D. A system of sanitary soil, waste, and vent piping including connections to fixtures and equipment as shown or indicated on the drawings.

1.3 CODES AND REGULATIONS

- A. All work performed under this section shall conform with all local governing regulations, and in case of conflicting requirements, the most stringent shall apply. Minimum requirements shall be the International Plumbing Code as published by the International Code Council.
- B. Should it be found that any part of the work shown or specified is not in accordance with local regulations, the Architect shall be so advised at the time of bidding and all work installed as required to meet the local codes.
- C. The Contractor shall comply with the latest revisions of all county, district, municipal, or local building codes, interpretations, buildings permits to include but not be limited to:

Florida Building Code – 2017 with all supplements
Florida Mechanical Code – 2017 with all supplements
Florida Plumbing Code – 2017 with all supplements

1.4 FEES AND PERMITS

- A. The Contractor shall obtain and pay for all permits, fees for inspection, and charges of every kind that may be necessary for fully completing the work. He shall make all necessary tests required by the City, County or State authorities, legal regulations and/or the Architect, and return to the Architect any certificates of approval issued in this district for plumbing work, etc., signed by the inspector in charge of each particular part of the work.

1.5 DEVIATIONS

- A. No deviations from the drawings and specifications shall be made without full knowledge and consent of the Architect. No backfilling of trenches will be permitted until as-built drawings are approved as up-to-date by the Architect.

1.6 COOPERATION

- A. The Contractor shall lay out and proceed with his work so that this work will be executed in harmony with all other contractors and trades on the job.

1.7 VISITING THE PREMISES

- A. The Contractor, before submitting his bid on the work, must visit the site and familiarize himself with all existing conditions. As a result of having visited the premises, the Contractor shall be responsible for the installation of the work as it relates to such existing conditions. The submission of a bid will be considered an acknowledgment on the part of the bidder of his visitation to the site.

1.8 VERIFICATION OF CONTRACT DRAWINGS

- A. The drawings and specifications are intended to cooperate. Any materials, equipment, or systems related to this section and exhibited on the architectural and plumbing drawings, but not mentioned in the specifications are to be executed to the intent and meaning thereof, as if it were both mentioned in the specification and set forth on the drawings. Where the Contractor finds the specification and/or drawings to be in conflict or where they are not clear, same shall be brought to the attention of the Architect prior to submitting a bid.
- B. The plans indicate the general arrangement of the utilities. The locations of piping are approximate for clarity. Exact locations shall be determined in the field by the Contractor. In the event it should become necessary to change the locations of any work due to building construction, etc., the Contractor shall secure the approval of the Architect before making the changes. Any changes approved by the Architect shall be made without added cost to the Owner. Under no circumstances shall the sizes indicated on the drawings be changed without securing written approval of the Architect.
- C. The drawings are diagrammatic and do not necessarily show or indicate all fittings, offsets, and accessories which may be required. The Contractor shall carefully investigate the structural and finish conditions affecting all his work as well as the operational requirements of each system and shall arrange such work accordingly, furnishing such fittings, etc., as may be

required for the proper and efficient functioning of each system. No unnecessary or unauthorized offsets will be permitted.

1.9 WORKMANSHIP

- A. All workmanship performed under this section shall be executed in a first class manner in accordance with the best practices of the trade. The Architect reserves the right to accept or reject workmanship and determine when the Contractor has complied with the requirements herein specified. Only competent mechanics skilled in their respective trades shall be employed by the Contractor.

1.10 RESPONSIBILITY OF BIDDER

- A. The failure or omission of any bidder to receive or examine any form, instrument, addendum or other document shall in no way relieve any bidder from any obligation with respect to his bid or the contract. The submission of a bid shall be taken as prima facia evidence of compliance with this paragraph and that he has included in his proposal every item of cost necessary for a complete installation of the plumbing systems as drawn and/or specified.

1.11 NOISE AND VIBRATION

- A. This Contractor shall be held responsible for elimination of all noises or vibrations transmitted to occupied areas from equipment which he may install. This applies particularly to vibration and noises in piping, water hammer, and vibration from mechanical equipment transmitted through bases to building structure. He shall furnish and install anti-vibration bases, flexible connectors for piping, etc., as may be necessary.

1.12 SUBMITTAL DATA

- A. Materials and equipment schedules shall be submitted as soon as practicable, but not later than 30 days after the date of award of contract, and before commencement of installation of any material or equipment. A complete schedule of the material and equipment proposed for installation shall be submitted in proper binders (3-ring or fastener type), for approval by the Architect. The schedule shall include catalogs, cuts, diagrams, drawings, specifications and such other descriptive data as may be required by the Architect. Each item submitted shall be marked with the same identifying tag number indicated on the construction documents. The schedule and supplementary data shall be submitted in six (6) copies, and approval obtained. All materials required to be submitted for approval under this section shall be submitted at one time.
- B. Partial submittals will not be considered. Each item submitted shall be identified by its applicable drawing number.
- C. Where equipment named as equivalent or approved equal are proposed for use by the Contractor, he shall be responsible for coordinating any changes with all trades affected.
- D. The following equipment and material shall be submitted for approval:
 - 1. Valves

2. Cleanouts
3. Access Panels
4. Insulation
5. Water Heater and Mixing Valves
6. Plumbing fixtures, including Traps, Supplies, and Carriers
7. Floor Drains
8. Trap Primers
9. Water Hammer Arrestors
10. Hose Bibbs and Wall Hydrants
11. Valve Boxes
12. Piping Materials and Fittings

1.13 START-UP SERVICE

- A. The Contractor shall put all items installed under this section into operation and shall instruct the Owner's maintenance personnel in all points requiring service and maintenance. Further, the Contractor shall make all adjustments and/or service requirements to said equipment during the first 60 days of actual occupancy.

1.14 MAINTENANCE DATA

- A. Operational, maintenance, and spare parts booklets shall be provided for all items of equipment requiring maintenance. Provide a minimum of three (3) copies and turn over to Architect. Bind in vinyl covered three-ring binders.

1.15 GUARANTEE

- A. All materials and equipment provided and/or installed under this section of the specifications shall be guaranteed for a period of one year from date of acceptance of the work by the Architect. Should any trouble develop during this period due to defective materials or faulty workmanship, the Contractor shall furnish all necessary labor and materials to correct the trouble without any cost to the Owner. Any defective materials or inferior workmanship noticed at time of installation and/or during the guarantee period shall be corrected immediately to the entire satisfaction of the Architect.

PART 2 – PRODUCTS

2.1 SOIL, WASTE, AND VENT SYSTEMS

- A. All soil, waste and vent lines shall be Schedule 40 PVC-DWV in accordance with Commercial Standard CS272-65 or ASTM Standard D2665-68. Soil, waste and vent lines penetrating a fire rated wall or floor shall be service weight cast iron at the point of penetration only.
- B. All plastic pipe shall bear the NFS Seal of Approval and such other markings as required by the aforementioned standards.
- C. All fittings and joints shall be solvent welded.

- D. Fixture runouts shall be DWV copper or brass piping with screwed or sweat joints respectively, with drainage pattern fittings.
- E. Unions will not be permissible in soil, waste, or vent piping.
- F. Test fittings required for system test are not shown on the drawings, but shall be provided by the Contractor where required.
- G. Grading: Minimum grade for soil pipe shall be as follows:
 - 1. For 2-inch pipe, grade shall be 1/4-inch per foot (minimum).
 - 2. For 3, 4 & 6 inch pipe, grade shall be 1/8-inch per foot (minimum).
- H. Vent Pipes:
 - 1. Main soil pipe stacks to be extended up through the building full size with increaser through roof per code.
 - 2. Connect branch vents into main stacks with connections not less than 4 feet above the highest fixture.
 - 3. All vent stacks shall be connected at the bottom to main drainage system and all horizontal runs shall be graded so as to discharge all water or condensation.
 - 4. Vents from any fixture, when connected to vent serving other fixtures, shall be extended at least 6" above flood level rim of height of such fixtures to prevent use of vent lines as a waste.

2.2 DRAINAGE SPECIALTIES

- A. Cleanouts: Provide accessible cleanouts at the foot of each soil and waste stack. Cleanouts shall be placed as per the Florida Building Code – Plumbing. Cleanouts shall be as manufactured by Smith, Josam, Zurn or approved equal.

Provide in sanitary piping at all changes in direction, at ends of branches, at intervals not exceeding 100' on straight runs, and elsewhere as shown. Cleanouts shall be full opening type completely accessible. Size same as lines in which they occur, but not larger than 4". Tees and extensions shall be of same weight as pipe. Plugs shall be countersunk PVC type.

- 1. In outside line, use 4280 "Smith" duco cast iron cleanout ferrule with countersunk PVC closure plug. Terminate flush with grade or pavement in concrete pad with tooled edges. Reference plumbing drawings for concrete pad details.
- 2. In finished walls, use cast iron cleanout tee fitting with PVC closure plug and stainless steel wall plate cover. Where distance from plug to finish wall will exceed 4", provide extended cover from sanitary tee to bring plug within 4".
- 3. In quarry tile floors, use 4180 duco cast iron cleanout with PVC closure plug and round adjustable secured nickel bronze top with 1/2" recess.
- 4. In carpeted floors, install under carpet. Do not cut carpet. Provide carpet marker for cleanout location.
- 5. In tile floors, use 4040 duco cast iron cleanout with square adjustable scoriated nickel bronze top; where soft tile occurs, provide 4160 with recessed square nickel bronze cover.
- 6. In concrete floors, use 4240 duco cast iron cleanout with round adjustable scoriated cast iron top with a loose set, non-tilt tractor cover.

- B. Floor Drains: Size outlets same as pipe to which they connect. Install temporary closures during construction. Provide type as scheduled below.
 - 1. Drains in Mechanical Equipment Room: Zurn Z1910 with 8"x8"x6" sump, inlet dome strainer and 1/2 top grate.
 - 2. Floor Drains in Finished Areas: J.R. Smith 2010-A duco cast iron body and flashing collar with round nickel bronze adjustable strainer head. Strainer tops for 3" drains shall be 6" round with chrome plated finish. Provide trap primer tapping where indicated.

2.3 DOMESTIC (POTABLE) WATER PIPING

- A. Type "L" copper tubing shall be used for all above grade piping and type "K" copper tubing shall be used for all below slab piping. Sweat fittings shall be either cast brass or wrought copper. Solder joints shall be cleaned with steel wool or emery cloth before applying soldering paste (flux) using lead-free solder for domestic water tubing. No other type of solder shall be used. No joints below floor slabs will be permitted. Copper pipe shall not come in direct contact with concrete or masonry materials. Reference specification section 'sleeves'.
- B. Grading: Pipe shall be graded upward from source to facilitate draining. Where low points are required because of long runs or where sections may be valved off, the low point will be provided with 3/4-inch globe valve and hose nipple for draining.
- C. Nipples: Of same materials as pipe in which they are installed; provide extra strong when unthreaded portion is less than 1" long.
- D. Shock Absorbers: Install Zurn Shocktrols or equal manufactured shockstops, PDI rated as indicated on drawings. Provide access door to all shockstops installed in concealed areas.
- E. All fittings on copper pipe shall be copper. The pipe and fittings shall be thoroughly cleaned before inserting into the joint and then soldered with lead free solder.
- F. Utility Connection: Utility Contractor will provide a connection to the water main and will connect to building water runouts as shown. Coordinate stub from building with utility drawings.
- G. Water Pressure: Supply system is designed for static pressure of 50 to 60 PSI. Gauge water supply adjacent to building to verify that pressure is within those limits. Submit report in writing.

2.4 SLEEVES

- A. All domestic water copper tubing and piping run below slab on grade or encased on concrete shall be sleeved with 27 mil flexible pipe protector for entire encased run and extending 6" beyond concealment. All pipes passing through masonry or concrete construction shall be fitted with sleeves. Sleeves in bearing walls, floors, and/or beams shall be made of Schedule 40 galvanized steel pipe. Sleeves in other masonry walls or core-drilled openings shall be 26 gage metal, PVC, or other approved material. Each sleeve shall extend through its respective wall, and shall be cut flush with each surface unless otherwise specified. Sleeves shall be two pipe sizes large in diameter than the passing pipe when uncovered, and one pipe size larger than the overall outside diameter of the covering when the passing pipe is insulated. Space

between all floor sleeves and passing pipes shall be made watertight by caulking with approved rope packing and plastic waterproof caulking compound as approved by the Architect. All sleeves shall be properly installed and securely cemented in place. All sleeves through floor or above grade in equipment space shall extend 1-inch above finished floor.

2.5 FLOOR, WALL, AND CEILING PLATES

- A. All pipes passing through the floors, walls, or ceilings of finished rooms shall be fitted with brass chrome plated floor, wall or ceiling plates, securely fastened in place by set screw. Plates shall be large enough to accommodate the piping, pipe insulation and completely conceal the wall opening around the penetrating pipe including wall sleeve. Wall and floor plates shall be of the deep pattern type where required.

2.6 HANGERS, CLAMPS, AND SUPPORTS

- A. Piping shall be supported by hangers and clamps. When secured to concrete or masonry, concrete inserts or expansion type devices approved and recommended for the application shall be used. The use of explosive anchoring devices is prohibited. Hangers and clamps shall be of similar material as piping or coated as required to prevent bimetallic electrolytic action. Hangers and clamps exposed to exterior conditions shall be stainless steel.
- B. Hangers shall be adjustable "split ring and bolt" type or "clevis" type. Hangers for insulated pipe shall be of size to allow pipe covering to pass through the hanger without crushing. Where pipe covering passes through the hanger, the covering shall be protected with rib-lock Insu-Shield pipe saddles as manufactured by Insul-Coustic Corporation, Elcen Iso-Shields, or approved equal.
- C. All hangers of one type shall be catalog items of one manufacturer.
- D. No plumbers strap shall be used.
- E. When hanger rods are over 18 inches in length, provide lateral bracing every fourth hanger.
- F. Hanger Spacing Schedule:
 - 1. General: Spacing is indicated in maximum distances based on pipe materials and sizes. Closer spacing shall be provided to conform to structural spacing and load capacity of structural support points.
 - 2. Cast Iron Pipe:
 - 5 ft. lengths – maximum 5 ft. on centers.
 - 10 ft. lengths – maximum 8 ft. on centers.
 - 3. Copper Pipe:
 - Up to 1-1/4" – maximum 5 ft. on centers.
 - 1-1/2" to 4" – maximum 8 ft. on centers.
 - 4. Steel Pipe:
 - Up to 1-1/2" – maximum 7 ft. on centers.
 - 2" to 4" – maximum 10 ft. on centers.

5" to 8" – maximum 16 ft. one centers.

5. Vertical Pipe: Same as horizontal spacing. Use riser clamps at upper floor slabs to support vertical weight of pipe; a minimum of every floor for cat iron pipe. Space as noted for other piping.
6. Changes in Direction: Provide support within 2 ft. of any change in direction or unconnected end.

G. Rod sizes for pipe hangers shall be as follows:

1. Pipe 2 inches and smaller - 3/8" rod
2. Pipe 2-1/2 inches and 3 inches- - 1/2" rod
3. Pipe 4 inches and larger - 5/8" rod

H. Support products shall be as cataloged by Fee and Mason, Elcen, Carpenter and Patterson, Grinnell, or approved equal.

2.7 UNIONS

- A. Unions shall be provided on inlet and outlet of all apparatus and equipment.
- B. Where valves are adjacent to equipment, unions shall be on downstream side of valves.
- C. Unions in copper pipe shall be cast bronze, WOG pattern, ground joint, 150 psi type.
- D. Unions in steel pipe shall be malleable iron, WOG female pattern, brass seat, ground joint, 150 psi type.
- E. Where dissimilar metal piping joins together, di-electric type unions shall be used to make the joint.

2.8 VALVES AND COCKS

- A. Valves and cocks shall be installed where shown on the drawings and/or where found to be necessary for proper operation of the system. All branches from risers, all branches from mains, and all fixtures or equipment not having stops shall be provided with valves whether shown or not.
- B. All valves shall be the product of one manufacturer as cataloged by Jenkins Brothers, Stockham, or Nibco.
- C. For water piping, valves shall be equal to 125 psi SWP/200 psi WOG Nibco as follows:
 1. Gate valves 1/2-inch to 3 inches = S-111
 2. Ball valves 1/2-inch to 2 inches = S-585
 3. Check valves 1/2-inch to 3 inches = S-413W

2.9 EXTERIOR HOSE BIBBS AND WALL HYDRANTS

- A. Wall hydrants shall be Zurn Model 1330, (or an approved equal) brass finish, freezeless, 3/4" size, vacuum breaker ASSE approved, automatic-draining. Contractor shall coordinate and verify wall thickness before ordering faucets. Wall hydrants shall be installed in a secure manor and in accordance with manufacturer's recommendation.

2.10 TRAP PRIMERS

- A. Install on water closet flush valves and fixture supplies and cold water distribution piping where indicated.
 - 1. Cold Water Distribution Piping: PPP "Dual Flow" automatic floor drain trap primer. Provide with distribution unit where multiple floor drains are served.
 - 2. Flush Valves: Zurn Model P6000-TPO.
 - 3. Cold Water Fixture Supply: Zurn Model Z-1022-CP.

2.11 BACKFLOW PREVENTERS

- A. Reference plumbing drawings for size, type, and location, otherwise, reduced pressure principle type, Watts Model 909, ASSE and AWWA approved.

2.12 ELECTRIC WATER HEATERS

- A. Water heater shall be by A. O. Smith or approved equal. See schedule for tank size and performance requirements. Heaters shall have 150 psig working pressure and be equipped with extruded high density anode. All internal surfaces of heaters exposed to water shall be glass-lined with alkaline borosilicate composition that has been fused to steel by firing at a temperature range of 1400 to 1600 degrees F. Electric heating elements shall be low watt density with incoloy sheath and 1" screw type. Each element shall be controlled by an individually mounted thermostat and high temperature cut-off. All internal circuits shall be fused. The outer jacket shall be of baked enamel finish and shall be provided with full size control compartment for performance of service and maintenance through hinged front panel and shall enclose the tank with foam insulation. Electrical junction box with heavy duty terminal block shall be provided. The drain valve shall be located in the front for ease of servicing. Heater tank shall have a three year limited warranty. Manufacturer shall supply an ASME rated temperature and pressure relief valve.

2.13 TANKLESS ELECTRIC WATER HEATERS

- A. Tankless water heater shall be an Eemax Thermostatic Model, with micro-processing temperature control capable of maintaining outlet temperature of +/- 1°F accuracy. Unit shall have ABS-UL 90Vo rated cover. Element shall be replaceable cartridge insert. Unit shall have replaceable filter in the inlet connector. Element shall be iron free, Nickel Chrome material. Heater shall be fitted with 1/2" pipe compression nuts (5/8" OD) or 3/8" sleeves, to eliminate need for soldering. The maximum operating pressure is 150 PSI. Hot water storage tanks prohibited. Unit shall be Eemax or approved equal.

2.14 ACCESS PANELS

- A. Provide Philip Carey, J. R. Smith, Zurn, or an approved equal. Unless noted otherwise, Smith Model #4761, 12" x 16" chromium plated steel access panels shall be installed where valves or shock absorbers occur in inaccessible walls or ceilings. It shall be the contractor's responsibility to coordinate access panel sizes to provide unrestricted valve service. All doors and covers to be completely removable from frames. All hinges must be concealed type. Steel frames shall be 16-gauge and doors 14-gauge. Access doors installed in fire rated assemblies shall be UL fire rated type with automatic closures. Access doors exposed to exterior conditions, installed in concrete block walls or poured concrete walls shall be stainless steel.

2.15 SHOCK ABSORBERS

- A. Install Zurn Shocktrols or equal manufacturer shockstops, PDI rated at all flush valve fixtures and fixtures groups where indicated on the domestic water piping plan.
- B. In lieu of shocktrols, air chambers of same materials and diameter as the supply pipe and 12 inches in height may be installed at fixtures in accordance with local plumbing code requirements.

2.16 THERMAL INSULATION WORK

- A. All insulation work shall be performed by experienced insulation application mechanics thoroughly familiar with and experienced in the application of insulation materials. All insulation materials shall be applied in accordance with manufacturer's published recommended methods. Installation and finish of insulation materials shall meet with complete approval of the Architect. Contractor shall submit complete data for approval of materials and application methods as proposed for use. All piping shall be pressure tested and all surfaces shall be thoroughly cleaned before covering is applied. Insulation materials including sealer, adhesive, finishes, etc., shall meet NFPA Standards with regard to flame spread and support of combustion.
- B. All piping as follows shall be covered with 1-inch thick heavy density fiberglass sectional pipe insulation equal to Owens-Corning Fiberglass 25 ASJ/SSL:
 - 1. Domestic Cold Water
 - 2. Domestic Hot Water

Note: Water piping below grade shall not be insulated.

- C. Storm drainage pipe run horizontal (exposed and concealed) shall be insulated for full horizontal run with 1" thick foil faced duct insulation including roof drain bodies. Vertical pipe shall not be insulated.
- D. Fittings for the above shall be insulated with premolded fitting insulation of the same material and thickness as the adjacent insulation and shall be covered with a plenum rated vapor barrier and sealed with vapor barrier lagging adhesive. Premolded plastic (PVC) covers shall not be installed in return air plenums. Adhere 3-inch wide butt joint strips over all end joints with vapor barrier adhesive. Covering adjacent to unions and other points of termination shall be finished with a plenum rated material neatly beveled.

- E. It shall be the responsibility of the insulation subcontractor to coordinate hanger locations and prevent crushing or breaking finishes.
- F. Traps and supplies of (ADA) handicapped lavatories and break room sinks shall be insulated with trap wrap protective kit 500R by Brocar or approved equal. Water cooler traps and above grade floor drain traps used for condensate removal shall be insulated with 1/2" Armaflex.

2.17 PLUMBING FIXTURES

- A. General: All fixtures including lavatories, urinals, water closets, etc., must be securely fastened to the walls or floor.
- B. Wall mounted fixtures: Support all wall mounted fixtures with solid blocking full length of fixture, built into wall or install a floor supported factory fabricated carrier system designed for securing selected fixture. Do not use toggle bolts or expansion bolts on metal stud walls.
- C. Water Closet Floor Connections: Provide cast iron or galvanized malleable iron floor flanges at 3/16" thick, screwed or caulked to drainage pipe. Bolt the connection and make tight to fixture with wax setting ring or polyethylene gasket flange.
- D. Water Supply Stub Outs: Provide brass nipple from water riser to fixture stop valve. (Steel pipe will not be approved). Exposed portion of nipple shall be chromium plated.
- E. Waste Arms to Fixtures: DWV copper or brass. Where copper or brass pipe is specified, all joints downstream from trap shall have soldered joints.
- F. Fixture Trim: Exposed metal parts shall be of heavy weight polished brass, heavily chromium plates, of best quality as regularly furnished by the plumbing fixture manufacturer. Provide stop valve in supply to all fixtures and equipment.
- G. Traps: Traps shall be provided for all fixtures. Sink and lavatory traps shall be removable type, chromium plated brass a minimum of 17 gauge unless otherwise specified. Size of trap shall be full P.O. size of fixture.
- H. Flexible Water Supplies: Provide flexible supplies with angle stops for all fixtures as required and as shown on plans.
- I. Plumbing Fixture Schedule: Provide all fixtures where indicated on the plumbing drawings. Color of all fixtures shall be white unless otherwise indicated. Seats for all water closets shall be commercial grade solid plastic with open front.
- J. Provide rough-in for and connect to supply lines, waste and vent lines, all equipment, fixtures, drains, etc., specified herein or in other sections of the specifications which require such connection.
- K. Provide stop valves in hot and cold water connections to each fixture. Provide deep escutcheon on all sinks and lavatories where waste pipe penetrates the wall. Anchor all water supply pipe securely within wall spaces and plumbing chases.

- L. Fixture types are indicated on the drawings by means of the "P" numbers. All fixtures submitted for approval shall have rough-in measurements or attached rough-in sheets and identified with the associated "P" number.
 - M. All exposed pipe and fittings shall be chromium plated brass unless otherwise indicated.
- P-1 WATER CLOSET – Kohler K-3505 floor mounted, pressure assisted tank toilet with left hand flush and Church 255 white open front seat. Provide quarter turn wall stop equal to Eastman and flexible supply.
 - P-1A WATER CLOSET (ADA Compliant – Left Hand Flush) – Kohler K-3493 floor mounted, pressure assisted tank toilet with left hand flush and Church 255 white open front seat. Provide quarter turn wall stop equal to Eastman and flexible supply.
 - P-1B WATER CLOSET (ADA Compliant – Right Hand Flush) - Kohler K-3493-RA floor mounted, pressure assisted tank toilet with right hand flush and Church 255 white open front seat. Provide quarter turn wall stop equal to Eastman and flexible supply.
 - P-2 URINAL – Kohler K-4904-ET wall hung urinal with Zurn 6003AV-ULF flush valve and Zurn ZR-122 wall carrier.
 - P-3 LAVATORY – Kohler K-2196, self-rimming vitreous china with Zurn Z81000-XL-3M, 0.5 GPM single lever type faucet and grid type drain. Provide McGuire 8872, 1-1/2", 17-gauge chromium plated P-trap with McGuire 167-LK angle stops and flexible risers.
 - P-3A LAVATORY (HANDICAPPED) – Kohler K-2005, 20" x 18" wall hung vitreous china with Zurn Z81000-XL-3M, 0.5 GPM single lever type faucet and grid type drain. Provide McGuire 8872, 1-1/2", 17-gauge chromium plated P-trap with McGuire 167-LK angle stops, flexible risers and Zurn ZR-1231 floor supported concealed arm carrier. Provide trap wrap 500R protective kit by Brocar or equal. Mount fixture in compliance with ADA for handicap use.
 - P-4 BREAK ROOM SINK – Just SLX-1815-A-GR 18-gauge stainless steel 18"x15"x9" sink. Provide T&S Brass B-2865-04 rigid gooseneck faucet, 1-1/2" 17-gauge p-trap, basket strainer, flexible supplies and quarter turn wall stops. Provide Insinkerator Badger 5 garbage disposal with 1/2 Hp motor and power cord under the sink.
 - P-5 MOP BASIN – 24" x 24" x 12" Fiat Model TSBC-6010 with wall mounted T&S Brass B-0665-BSTR service faucet with top brace, stops, vacuum breaker, metal lever handles and threaded spout. Provide with 3" stainless steel drain.
 - P-6 HI/LOW WATER COOLER (ADA Compliant) – Wall mounted, stainless steel, barrier free, bi-level water cooler, Elkay EZSTL8C with 1-1/4", 17-gauge chromium plated P-trap (continuous waste), quarter turn angle stop, and Zurn Z-1225 floor supported concealed arm carrier. Mount fixture in compliance with ADA for handicap use.
 - P-7 ICE MAKER VALVE BOX – 9"x6" full recessed, Guy Gray BIM875 with 1/2" FIP inlet x 1/4" O.D. outlet compression angle valve.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION INSTRUCTIONS

- A. The Contractor shall provide for expansion and contraction of all piping and must make proper provisions so that there will be no undue strain on any of the piping or any part of the work.
- B. Wherever changes in sizes of piping occur, changes shall be made with reducing fittings. The use of bushings will not be permitted.
- C. Minimum bury for exterior piping shall be 18" below finish grade, or as required by local code.
- D. Cutting and boring through structural members shall be done only when approved by and under supervision of Architect and/or Structural Engineer.
- E. All pipe openings shall be closed with wooden plugs or metal or plastic caps during construction. The plugs or caps shall be installed when the pipes are roughed-in and shall not be removed until final connections are made.
- F. Fittings and lengths of pipe shall be examined internally before assembly and, if necessary, freed from scale or dirt. Piping shall be thoroughly blown out after assembly to remove foreign materials.
- G. Plated, polished or soft metal piping shall not show tool marks or abrasions.
- H. Offsets in all piping above grade shall be made with fittings. Bending of pipe shall not be permitted.
- I. All piping penetrations of fire proofing material shall be resealed using a U.L. listed fire proofing material.

3.2 EXCAVATION, TRENCHING AND BACKFILLING

- A. The Contractor shall do all slab cutting/removal and excavation necessary for pipe installation required in this section. He shall backfill all such trenches and excavations after work has been installed and tested, removing all surplus earth to such point as may be directed. Care must be taken in excavating that walls and footings and adjacent load bearing soils shall not be disturbed in any way except where lines must cross under a wall footing. Where a line must pass under a footing, the crossing shall be made by the smallest possible trench to accommodate the pipe. Excavations shall be kept free from water by pumping. Fill and backfill shall be in accordance with local plumbing code requirements and applicable requirements of "Earthwork" section.
- B. Trenches will be made true to grade by means of substantial and accurately set batter boards not more than 50 feet apart with taut cord or wire stretched between them. Care shall be exercised to insure that the pipe is bedded on undisturbed earth.

- C. Trenches located inside foundations walls and to a point five (5) feet outside of same shall be not less than 16 inches or more than 24 inches wider than the outside diameter of the pipe to be laid therein. Bottoms of trenches shall be accurately graded with bell holes scooped out to provide uniform bearing and support of pipe on undisturbed soil throughout its entire length, except where other means of supporting pipe are indicated. No greater length of trench shall be left open in advance of pipe and utility laying than that which is authorized or directed by the Architect.
- D. Bottoms of trenches shall be so shaped that when pipe is in place, the lower fourth of the circumference for the full length of the barrel will be supported on undisturbed earth. Bell holes shall be dug so that no part of the weight of the pipe is supported by the bell, but shall be no larger than necessary for proper jointing. Soft spots under pipe shall be excavated to solid subgrade. Rock or rocky materials shall be excavated to at least six (6) inches below pipe invert. Pipe bed shall then be backfilled with fine gravel or coarse sand, well tamped in place.
- E. Immediately after testing and/or inspection, the pipe trench will be carefully backfilled with earth free from clods, brick etc., to a depth one-half the pipe diameter and then firmly compacted in such a manner as not to disturb the alignment of joints of the pipe. Thereafter, the backfill shall be compacted tamped every vertical foot. No clods, brick, stones, etc., shall be placed in the trench. The last 18 inches of fill shall be clean earth.
- F. The Contractor shall be responsible for protecting his workmen, the workmen of others, or the work of others by shoring trenches and excavations where depth of trenches or excavations; wet, plastic or unstable soil; soil loaded with erected or stored materials; or any other such condition would cause a hazard. The Contractor may exercise his own judgment as to the necessity of shoring, but the Architect reserves the right to order shoring placed if he deems it necessary.

3.3 OPENINGS AND SLEEVE LOCATIONS

- A. This Contractor shall cooperate with the work to be done under other sections in providing information as to the openings required in walls, slabs, and footings for all piping including sleeves where required.
- B. Any drilling or cutting required for the performance of work under this section shall be the responsibility of this Contractor and the cost thereof shall be borne by him.
- C. Sleeves shall be furnished, accurately located and installed in forms before pouring of concrete. This Contractor shall pay all additional costs for cutting of holes as the result of the incorrect location of sleeves. All holes through existing concrete shall be either core drill or saw cut. All holes required shall have the approval of the Structural Engineer prior to cutting or drilling. Sleeves shall be inserted and grouted into place.
- D. It shall be the responsibility of this Contractor to ascertain that all openings are properly located.

3.4 MATERIALS AND EQUIPMENT

- A. All materials and equipment furnished under this section of the specifications shall be new, of quality specified, and as listed in printed catalogs of the manufacturer. Unless otherwise specified, all items shall have the manufacturer's standard finish.
- B. Each article of its kind shall be the standard product of a single manufacturer; however, the component parts of the plumbing system need not be the products of the same manufacturer.
- C. Trade names or manufacturer's names and manufacturer's model or figure numbers used in this specification are used to establish the type, character, and quality of materials and equipment to be furnished. Approved equal products of other manufacturers will be accepted.
- D. The Architect shall have the right to accept or reject material and equipment and determine when the Contractor has complied with the requirements herein specified.
- E. All manufactured materials shall be delivered and stored in their original containers. Equipment shall be clearly marked or stamped with the manufacturer's name and rating.

3.5 STERILIZATION

- A. The entire water distribution system shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine. The chlorinating materials shall be acceptable by the State Board of Health authorities, and shall be introduced into the system in accordance with their recommendations. The sterilizing solution shall be allowed to remain in the system for a period of eight (8) hours during which time all valves and faucets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water. The complete sterilization operation shall be approved by the State Board of Health authorities.

3.6 TESTS

- A. The Contractor shall notify the Architect and the plumbing inspector three (3) working days before any tests are to be made. All tests shall be made in their presence. Repair of defects that are discovered as a result of inspection of tests shall be made with new materials. Caulking of screwed joints, cracks, or holes shall not be accepted. Tests shall be repeated after defects have been eliminated.
- B. Tests of Sanitary Sewer and Storm Water Piping: A water test shall be applied to all parts of the drain and vent system before piping is concealed or fixtures set in place. All openings to be plugged water tight, the entire system filled with water to the top of vents through roof, (or no less than 10 foot head of water) and left at least 30 minutes without leakage. After fixtures are permanently connected and traps are filled with water, entire sanitary system shall be smoke tested in accordance with the requirements of the International Plumbing Code Section 312. A ball test shall be performed to insure a complete operation of the sanitary waste system.
- C. Test of Domestic Water Piping: A water test shall be applied after installation of piping is complete but, before piping is concealed, and before plumbing fixtures are connected.

System shall be filled with potable water and kept under hydrostatic pressure of 150 pounds per square inch for two (2) hours with no leaks.

- D. All equipment and materials required for tests shall be provided by the Contractor.

3.7 CLEANING EQUIPMENT AND MATERIALS

- A. Provide for the safety and good condition of all materials and equipment until final acceptance by the Architect. Protect all materials and equipment from damage. Provide adequate and proper storage facilities during the progress of the work. Special care shall be taken to provide protection for bearings, open connections, pipe coils, pumps, compressors and similar equipment.
- B. All fixtures, piping, finished surfaces and equipment shall have all grease, adhesive labels and foreign materials removed.
- C. All piping shall be drained and flushed to remove grease and foreign matter. Pressure regulating assemblies, strainers, traps, flush valves and similar items shall be thoroughly cleaned.
- D. Any equipment or material that is damaged or marred shall be replaced with no additional charges when so directed by the Architect.
- E. Upon completion of the work, the Contractor shall remove from the premises all unused material and debris resulting from the performance of work under this section, and leave the premises in a finished, clean and sanitary operating condition ready for occupancy by the Owner.

END OF SECTION

SECTION 15800 - HEATING, VENTILATION AND AIR CONDITIONING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Include all materials, equipment and labor necessary for a complete and properly functioning mechanical installation in accordance with local and state codes, contract drawings, and as specified hereafter.

1.2 DRAWINGS

- A. Mechanical drawings are diagrammatic and indicate the general arrangement and extent of work. Exact locations and arrangements of materials and equipment shall be determined in the field, with the approval of the Architect, as work progresses to conform in the best possible manner with the existing surroundings and with the adjoining work of other trades.

1.3 COORDINATION OF WORK

- A. Prior to installation, coordinate all work with work of other trades to preclude interferences between the work of different trades and to insure necessary clearances at crossovers for new equipment. Work requiring necessarily fixed locations such as graded piping shall take precedence over work not requiring such fixed locations and shall establish permissible routing of services associated with the latter. Should work be performed without adequate coordination so that interferences occur between work of different trades, Contractor shall eliminate such interferences by requiring necessary rework by the trades involved. Such rework shall meet approval of Architect and shall incur no additional cost to Owner. To avoid confusion and in the interest of clearances on the mechanical drawings, the work is not always shown to scale or in its exact location. The Contractor must check all measurements and locations of ducts, pipe and fittings and equipment with the detail and architectural drawings and lay out his work at the building so that all parts of this work will fit in with other parts of the building. If any dispute or doubt arises as to the meaning of the plans and specifications, the same shall be taken up with the Architect and his decision procured before proceeding with such parts of the work as may be affected. Failure to observe the foregoing instructions will make the Contractor liable for all damages to other work and for removing and repairing his own work in proper manner.

1.4 CODES, PERMITS, TAXES

- A. Governing Law: Work shall meet requirements of applicable codes, ordinances, rules and regulations, in effect at time of signing contract of any body or bodies having jurisdiction, including utilities.
- B. Correction of Work: Work done contrary to above requirements shall be corrected at no additional cost to Owner.

- C. Permits, Fees and Taxes: Secure and pay for all necessary permits, inspections, licenses, meters, connections, etc., that may be required; pay all required taxes. Owner shall pay any environmental impact fee incurred.

1.5 DISCREPANCIES

- A. In case of differences between drawings and specifications or where drawings and/or specifications are not clear or definite, the subject shall be referred to Architect for clarification and instructions. Such items should be directed to Architect prior to taking bids.
- B. All decisions shall be clarified in writing.

1.6 SUBMITTALS

- A. Shop Drawings: Before commencing work, submit drawings of all mechanical materials and equipment to be furnished under this contract. In addition, submit other drawings or diagrams, dimensioned and in correct scale, requested by Architect to clarify the work intended or to show its relationship to adjacent work or work of other trades. Drawings shall clearly indicate all characteristics, special modifications or features, and exceptions to or deviations from contract requirements.

1.7 INSTRUCTIONS

- A. Personnel: After completion of installation, competent personnel shall be furnished to instruct Owner's personnel in operation and maintenance of systems.
- B. Written: Furnish three (3) copies of instructions for operating various systems, including complete description of functions and operations of each piece of equipment, automatic control system, and diagrams indicating automatic control hook-up. Control devices shall be identified and their actual location in building noted on diagrams. Include cleaning, oiling, and greasing instructions of each item of equipment. Spare parts list and source of supply shall be identified for each item of equipment. Furnish in loose-leaf hardboard 3-ring binders to Architect (for delivery to Owner). Each item included in binder shall be properly indexed.

1.8 FINAL CHECK

- A. Before submitting proposals, each bidder shall examine all drawings and specifications issued by the Architect and shall examine the site of work. He shall be fully informed as to character of his work and coordination of his work with that of other trades. No consideration will be given at a later date for alleged misunderstandings as to requirements of work, materials to be furnished or conditions required by nature of site.

1.9 FOUNDATIONS

- A. The Contractor shall furnish all special foundations and supports for equipment which he installs and which are separate and distinct from building construction as shown on the drawings.

1.10 SAFETY PROVISIONS

- A. Belts, pulleys, chains, gears, couplings, projecting set screws, keys and other rotating parts located so that any person may come in close proximity thereto, shall be fully enclosed or properly guarded.
- B. Belt guards over fans shall be provided with Tach Wells.

1.11 RELATED WORK

- A. The following items of material and labor incidental to or related to the work will be provided as follows:
 - 1. Concrete forming and pouring, custom metal fabrication, painting, and general corrosion proofing and any other collateral work made necessary by the requirements of this section shall be performed by persons who are qualified in and specialize in that type of work or trade.
 - 2. All electrical power wiring, conduit, etc., for motors shall be furnished and installed by the electrical contractor. Electrical automatic control devices, relays, etc., required for electrical interlock for operation of system shall be furnished complete by this Contractor in strict accordance with all requirements of wiring specifications as a part of the control system. Motor starters shall be provided under the controls section of this specification except where provided as an integral part of the equipment.

1.12 CUTTING AND PATCHING

- A. Mechanical subcontractors shall not do cutting and patching. This work shall be performed only by the original contractor whose work was cut or patched. No structural members may be cut, patched or disturbed without approval of the Architect.
- B. The Contractor shall be responsible for blocking out and sleeving all openings in floors, walls, and ceilings for new piping, ductwork, etc., before concrete is poured.
- C. The Contractor shall be responsible for closing openings in floors, walls, and ceilings around new piping and ductwork to the satisfaction of the Architect. Protect the integrity of all fire rated assemblies.
- D. All finishes for openings shall be the responsibility of the General Contractor.

1.13 QUALITY

- A. Conform to the quality and features specified and indicated by drawings. Where material or equipment is indicated or necessary, but not specifically described in the specifications or drawings, such shall conform to the quality and features of similar items so described or otherwise indicated.

PART 2 - PRODUCTS

2.1 MOTORS AND STARTERS

- A. Motors: Unless otherwise specified, each motor shall have sufficient capacity to start and operate the machine it drives without exceeding the motor nameplate rating at the speed required. (Except that the NEMA standard service factor may be applied to motors that are water or refrigerant cooled.) The horsepower specified are those estimated to be required by the equipment when operating at specified duties and efficiencies. If the actual horsepower for the equipment to be furnished differs from that specified or indicated on drawings, it shall be the responsibility of the Section furnishing equipment to insure that proper size feeders, breakers, etc., are provided at no change in contract cost. Motors shall be rated for continuous duty, at 100% of nameplate rating. Squirrel cage induction motors shall have normal starting torque, full voltage low starting current, constant speed continuous duty type. Motors shall be wound for specified voltage.
- B. Starters: Starters shall be furnished and installed by the Electrical Contractor.
 - 1. General: As specified with modifications and accessories as indicated in other Sections of this specification or by control diagrams on drawings. Starters shall have proper rating for motors controlled. Starters for motors 30 HP and less shall be across-the-line type. Starters for motors larger than 30 HP shall be of the wye-delta closed transition type.
 - 2. Over current Protection: Contacts shall break each ungrounded line to the motor. A thermal over current device shall be provided in each ungrounded line. All contacts shall open simultaneously upon tripping of any over current device.
 - 3. All 3-phase motors shall be provided with phase loss and phase reversal protection. Protection equipment shall be equal to SymCom MotorSaver Model 4603
 - 4. Magnetic Starters: For motors of ½ HP or larger, combination type with unfused disconnect switch, unless specified otherwise in other sections. Each starter shall have a control transformer with fused 120 volt maximum control circuit. Control transformer shall be of adequate capacity for all controls on the circuit.
 - 5. Manual Starters: Provide for motors through 1/3 HP unless specified otherwise under equipment specifications.
 - 6. Enclosures: Enclosures for starters and other controls equipment installed indoors may be NEMA 1. Outdoor enclosures shall be NEMA 4 or 4X of aluminum, stainless steel, or reinforced polyester resin construction.

2.2 BELT DRIVES

- A. Each motor driven machine not directly connected shall be equipped with V-belt drive. Belts shall be of correct cross section to fit properly in sheave grooves. Belts for each drive shall be carefully matched. Sheaves shall be of cast iron or steel, bored to fit properly on shafts and secured with keys of proper size. Variable and adjustable pitch sheaves shall be furnished for fans and shall be selected so that required rpm will be obtained with sheave set approximately in mid-position. Rating of each drive shall be as recommended by manufacturer for service, but shall be at least 1.5 times nameplate rating of motor.

2.3 BELT AND COUPLING GUARDS

- A. Equip each belt drive with a guard constructed of #12 U.S. standard gauge 3/4" diamond mesh steel wire screen or equivalent, welded to 1/2" steel angle frames which shall enclose all belts and sheaves. Tops and bottoms of guards shall be of #18 U.S. standard gauge steel. Braces or supports must not "bridge" sound and vibration isolators. Guards shall be designed with

adequate provision for movement of motor required to adjust belt tension. Provide means to permit oiling, use of speed counters, and other maintenance and testing operations with guard in place. All direct drive equipment shall have coupling guards in accordance with OSHA safety regulations.

2.4 PAINTING

- A. Touch-up of shop coats shall match equipment factory finishes.

2.5 SLEEVES

- A. Pipe Sleeves: Pipe sleeves shall be Schedule 40 PVC or asphalt coated, mild steel built into wall, sized to pass pipe leaving a clear space of 1/4" minimum between pipe and sleeve.

- 1. Sleeves for pipe passing through existing mechanical room slab shall be set before floor patch is poured and shall extend 1/2" above finished floor. Where pipe is insulated, sleeves shall be large enough to accommodate insulation.

- B. Sealing of Sleeves:

- 1. Below Grade: Caulk annular space between pipe and sleeve using oakum and poured lead both sides minimum 1" deep to make floor penetration water-tight. Provide leak ring in center of wall.

Caulk openings around sleeves to make watertight with Oleo-Resinous architectural grade sealant for interior and exterior use without painting, gun consistency, off-white color, unless otherwise noted. Gibson-Homan's Eternaflex, DAP Flexi-Seal, Pecora's Synthcalk GC-9, or Sonneborn's Sonolastic.

- C. Properly safe all piping penetrations of floor slabs and rated partitions.
- D. Fire safe all pipe penetrations (horizontal and vertical) through fire rated structures to maintain the structure's fire rating. Fire-safing shall be by 3M or approved equal.
- E. Where pipes pass through finished floors, walls, or ceilings, provide chromium plated brass escutcheons. Escutcheons on insulated lines shall be large enough to extend around insulation. All escutcheons shall be firmly attached to pipe and shall cover entire masonry openings.

2.6 SUPPORTING DEVICES

- A. Inserts: Self-drilling style expansion shields shall be used in concrete. Toggle bolts shall be used on block walls and partitions.

2.7 BOLTS AND INSERTS

- A. Provide inserts and bolts for supporting equipment.

2.8 PIPE AND FITTINGS

- A. Pipe, fittings, and grades shall be as listed below unless noted otherwise.
- B. Drain Riser Piping: Type "M" hard drawn copper with wrought copper sweat pattern fittings. Solder all joints with 50/50 composition solder.

2.9 REFRIGERANT PIPING

- A. Piping shall be type "K" hard drawn copper, ASTM Spec. B280, and shall be mill cleaned, dried and capped.
- B. Fittings shall be extra heavy wrought copper in accordance with ANSI B9.1 with joints soldered using a high content silver alloy solder.
- C. Sizing and installation shall be in accordance with unit manufacturer's requirements for high rise application where required with all piping secured with approved galvanized hangers and clamps where run exposed in mechanical rooms. Hangers, supports and clamps exposed outdoors shall be stainless steel. Entire installation shall be in accordance with ASHRAE Standard 15 for refrigerant piping. Provide all necessary refrigerant piping specialties as recommended by unit manufacturer for high rise application or maximum refrigerant line runs.
- D. Insulate refrigerant suction line with 3/4" wall foamed plastic insulation slipped over tubing and all joints thoroughly sealed. Paint insulation with two coats of acrylic protective paint where insulation is exposed to weather. Protect insulation with metal saddles and shields at all hanger or clamp points.
- E. Route all refrigerant piping as indicated on drawings from outdoor unit to indoor air handler/evaporator through piping chases, wall spaces, and ceiling areas.
- F. Piping diagrams shall be submitted by unit manufacturer showing pipe sizes, traps, service valves, etc., required for proper operation of equipment.
- G. Test each refrigerant system at 450 psi before charging system where units are to be field charged. System is to be thoroughly purged and evacuated before charging with R-410A in accordance with manufacturer's recommendations.

2.10 VARIABLE REFRIGERANT FLOW SYSTEM WITH HEAT RECOVERY

- A. SYSTEM DESCRIPTION R2-SERIES (SIMULTANEOUS HEAT/COOL)
 - 1. Per the equipment schedule, the variable capacity, heat pump heat recovery air conditioning system basis of design is Mitsubishi Electric CITY MULTI VRF (Variable Refrigerant Flow) zoning system(s).
 - 2. Acceptable alternative manufacturers, assuming compliance with these equipment specifications, are Daikin, Panasonic, LG, Carrier, and Trane. Contractor bidding an alternate manufacturer not listed does so with full knowledge that that manufacturer's product may not be acceptable or approved and that contractor is responsible for all specified items and intents of this document without further compensation.
 - 3. Simultaneous heating/cooling (heat recovery) systems shall consist of an outdoor unit, BC (Branch Circuit) Controller (or comparable branch devices), multiple indoor units, and

an integral DDC (Direct Digital Controls) system. Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. To ensure owner comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8 degrees F from set point for ten minutes.

4. No additional branch circuit controllers (or comparable branch devices) than shown on the drawings/schedule may be connected to any one outdoor unit. Contractors proposing alternate systems requiring more branch devices than those included as the basis of design are responsible for additional piping & electrical costs and are required to identify additional costs & installation time required of other trades with their bid.
5. The CITY MULTI units shall be covered by the manufacturer's limited warranty for a period of one (1) year parts and seven (7) year compressor to the original owner from date of installation.
6. The CITY MULTI VRF system shall be installed by a contractor with extensive CITY MULTI install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

B. R2-SERIES SIMULTANEOUS HEAT/COOL (HEAT RECOVERY), AIR COOLED OUTDOOR UNITS

1. General: The outdoor unit modules shall be air-cooled, direct expansion (DX), multi-zone units used specifically with VRF components described in this section. The outdoor unit modules shall be equipped with a single compressor which is inverter-driven and multiple circuit boards—all of which must be manufactured by the branded VRF manufacturer. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.
 - a. Outdoor unit shall have a sound rating no higher than 62 dB(A) individually or 62 dB(A) twinned. Units shall have a sound rating no higher than 51 dB(A) individually or 54 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
 - b. Refrigerant lines from the outdoor unit to the indoor units shall be insulated in accordance with the installation manual.
 - c. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
 - d. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
 - e. VRF system shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.
 - f. The outdoor unit shall be capable of operating in heating mode down to -4°F ambient temperatures or cooling mode down to 23°F ambient temperatures, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.
 - g. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained. Oil return sequences must be enabled only during extended periods of reduced refrigerant flow to ensure no disruption to correct refrigerant flow to individual zones during peak loads. Systems which might engage oil return sequence based on hours of operation risk oil return during inopportune periods are not

- allowed. Systems which rely on sensors (which may fail) to engage oil return sequence are not allowed.
- h. Unit must defrost all circuits simultaneously in order to resume full heating more quickly during extreme low ambient temperatures (below 23F). Partial defrost, also known as hot gas defrost which allows reduced heating output during defrost, is permissible only when ambient temperature is above 23F.
2. Unit Cabinet:
 - a. The casing(s) shall be fabricated of galvanized steel, bonderized and finished.
 - b. Panels on the outdoor unit shall be scratch free at system startup. If a scratch occurs the salt spray protection is compromised and the panel should be replaced immediately.
 3. Fan:
 - a. Each outdoor unit module shall be furnished with direct drive, variable speed propeller type fan(s) only. Fans shall be factory set for operation at 0 in. WG. external static pressure, but capable of normal operation with a maximum of 0.24 in. WG. external static pressure via dipswitch.
 - b. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
 - c. All fans shall be provided with a raised guard to prevent contact with moving parts.
 4. Refrigerant and Refrigerant Piping:
 - a. R410A refrigerant shall be required for systems.
 - b. Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the VRF equipment manufacturer and installed in accordance with manufacturer recommendations.
 - c. All refrigerant piping must be insulated with ½" closed cell, CFC-free foam insulation with flame-Spread Index of less than 25 and a smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102. R value of insulation must be at least 3.
 - d. Refrigerant line sizing shall be in accordance with manufacturer specifications. Future changes to indoor unit styles or sizes must be possible without resizing/replacing refrigerant piping to any other branch devices or indoor units.
 5. Coil:
 - a. The outdoor heat exchanger shall be of zinc coated aluminum construction with turbulating flat tube construction. The coil fins shall have a factory applied corrosion resistant finish. Uncoated aluminum coils/fins are not allowed.
 - b. The coil shall be protected with an integral metal guard.
 - c. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
 6. Controls:
 - a. Outdoor unit shall include Variable Evaporator Temperature or comparable method of varying system evaporator (refrigerant) temperature in order to reduce compression ratio and power consumption during light load or mild ambient temperatures. Multiple evaporator refrigerant temperature settings shall be required in order to optimize efficiency within required system-specific performance and installation constraints. System shall reduce compression ratio only when/if all indoor units are within 1.8F of setpoint; reducing compression ratio based solely on ambient temperature risks discomfort and is not allowed. Variable Evaporator Temperature or comparable method shall incorporate override or disable capability based on external signal to allow for space humidity control or load demand. The unit shall be an integral part of the system & control network described in Part 5 (Controls) and react to heating/cooling demand as

communicated from connected indoor units over the control circuit. Required field-installed control voltage transformers and/or signal boosters shall be provided by the manufacturer.

- b. Each outdoor unit module shall have the capability of 4 levels of demand control based on external input.
- 7. Electrical: The outdoor unit electrical power shall be 208/230 volts, 3-phase, 60 hertz per equipment schedule.
- 8. Refrigerant valves: Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.
- 9. Condensate Management: BC Controller (or comparable branch device) must have integral resin drain pan or insulate refrigeration components with removable insulation that allows easy access for future service needs. Cabinets filled with solid foam insulation do not allow for future service and are not allowed.

C. WALL MOUNTED INDOOR UNIT

- 1. General: The wall-mounted indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
- 2. Unit Cabinet:
 - a. All casings, regardless of model size, shall have the same white finish
 - b. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining are required.
 - c. There shall be a separate back plate which secures the unit firmly to the wall.
- 3. Fan:
 - a. The indoor fan shall be statically and dynamically balanced to run on a single motor with permanently lubricated bearings.
 - b. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
 - c. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.
- 4. Filter: Return air shall be filtered by means of an easily removable, washable filter.
- 5. Electrical:
 - a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
 - b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz)
- 6. Controls:
 - a. The unit shall include an IR receiver for wireless remote control flexibility
 - b. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

D. 4-WAY CEILING-RECESSED CASSETTE WITH GRILLE FOR 2X2 GRID INDOOR UNIT

- 1. General: The indoor unit shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-

diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.

2. Unit Cabinet:
 - a. The cabinet shall be a compact 22-7/16" wide x 22-7/16" deep so it will fit within a standard 24" square suspended ceiling grid.
 - b. The cabinet panel shall have provisions for a field installed filtered outside air intake.
 - c. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.
3. Fan:
 - a. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
 - b. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
 - c. The indoor fan shall consist of three (3) speeds, Low, Mid, and High.
 - d. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
 - e. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.
4. Filter: Return air shall be filtered by means of a long-life washable filter.
5. Electrical:
 - a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
 - b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
6. Controls:
 - a. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
 - b. A factory-installed drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

E. MEDIUM STATIC CEILING-CONCEALED DUCTED INDOOR UNIT

1. General: The ceiling-concealed ducted indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.
2. Unit Cabinet:
 - a. The unit shall be ceiling-concealed, ducted—with a 2-position, field adjustable return and a fixed horizontal discharge supply.
 - b. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. Fan:

- a. Indoor unit shall feature multiple external static pressure settings ranging from 0.14 to 0.60 in. WG.
- b. The indoor unit fan shall be an assembly with statically and dynamically balanced Sirocco fan(s) direct driven by a single motor with permanently lubricated bearings.
- c. The indoor fan shall consist of three (3) speeds, High, Mid, and Low plus the Auto-Fan function
- 4. Filter:
 - a. Return air shall be filtered by means of a standard factory installed return air filter.
 - b. Optional return filter box (rear or bottom placement) with high-efficiency filter as noted on equipment schedule.
- 5. Electrical:
 - a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
 - b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
- 6. Controls: Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

F. CEILING-SUSPENDED INDOOR UNIT

- 1. General: The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. The unit shall have an auto-swing function for the horizontal vane. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
- 2. Unit Cabinet: The casing shall have a white finish.
- 3. Fan:
 - a. The indoor unit fan shall be an assembly with two, three, or four Sirocco fan(s) direct driven by a single motor.
 - b. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
 - c. The indoor fan shall consist of four (4) speeds, Low, Mid1, Mid2, and High, and Auto fan function.
- 4. Filter: Return air shall be filtered by means of an easily removable, washable filter.
- 5. Electrical:
 - a. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
 - b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz)
- 6. Controls:
 - a. Manufacturer to provide drain pan level sensor powered by a 20-year life lithium battery. Sensor shall require no external power for operation and shall have an audible indication of low battery condition.
 - b. The drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

2.11 SPLIT SYSTEM 100% OUTDOOR AIR PRE-TREATMENT UNITS

- A. General requirements: The system shall be as manufactured by Addison, Aeon or another pre-approved equal. The system shall be provided as a complete and fully functional system with all accessories, piping and controls required for proper operation.

- B. Vertical indoor air handling units:

Evaporator: The evaporator coil is aluminum plate-finned formed on multiple rows of seamless copper tubing arranged in a staggered tube configuration.

Blower: A forward curved, Double width double inlet centrifugal blower is used for the indoor air. The blower wheel is mounted on a solid steel shaft supported by sealed ball bearings. The shaft is driven by adjustable belt drive sheaves connected to a 1725 rpm motor. The blower has sealed ball bearings that do not require lubrication. Optional air foil fans are available.

Blower Motor: A four-pole motor is standard and it operates at 1725 rpm. The motor has sealed ball bearings that do not require lubrication. Motors through 3/4 horsepower are inherently protected (auto reset) and motors 1.0 horsepower and larger high efficiency and have external starters (manual reset).

Control Kit: Shipped loose for field mounting next to the air handler; the control kit includes the blower motor contactor or starter.

REFRIGERANT CIRCUIT COMPONENTS

Thermostatic Expansion Valve: The expansion valve is adjustable and factory installed. Distributor tubes from the expansion valve meter the refrigerant evenly to the evaporator refrigerant circuits.

Hot Gas Bypass Tee: Provided to facilitate piping of this circuit to the condensing unit. The hot gas bypass circuit is provided for capacity control by maintaining a constant suction pressure at the compressor.

Hot Gas Reheat: Provide a one-row hot gas reheat coil is available with a single line supply system. The return gas is fed into the evaporator.

- C. Outdoor condensing Unit

Heavy Duty Cabinet: All models are constructed of G-90 galvanized steel. Bases are minimum 16-gauge, corner posts minimum 18-gauge, access panels are minimum 20-gauge and top pans are 18-gauge minimum.

Paint Finish: Constructed of hot dipped galvanized G-90 steel that is chemically treated with zinc phosphate, coated with 0.2 to 0.3 MIL polyurethane primer then finished with .07 to .08 MIL polyester top coat. Finish meets or exceeds 1,000 hour Salt Spray Test per ASTM B117 97.

Non-Corroding Hardware: Exterior nuts, bolts, washers and screws are carbon steel coated with Magnigard Silver 17, an epoxy finish containing aluminum flake pigment that meets or exceeds 10,000 hour Salt Spray Test per ASTM B117 97.

Discharge Air: All discharge air is directed up which eliminates the effects of wind direction and minimizes airflow sound projection.

Fan Motor and Fan: Fan motors are TEAO (IP54), thermally-protected and fitted with permanently lubricated/sealed ball bearings. Propeller fans are constructed of Spcc sheet steel with black powder coating. Rotor is silicon sheet lamination with aluminum casting. Fans are statically and dynamically balanced to provide efficient operation.

Coated Fan Guards: Fan guards are vinyl coated for long life.

Copper Tube Coils: The standard coils have copper tubes and mechanically bonded aluminum fins and are minimum two rows.

Compressor: High efficiency scroll compressors have been selected for their refrigeration reliability in these units. All compressors have crankcase heaters and the motors are equipped with internal overheat-overload protection. Compressors are rated for R410A refrigerant.

Compressor Protection: Suction accumulators, refrigerant receiver, filter driers, crankcase heaters, high and low pressure controls provide the ultimate in compressor protection on all models.

Refrigerant Circuit: For long line applications, a liquid receiver is required to ensure correct oil charge at the compressor.

Refrigerant Lines: All refrigerant lines are stubbed outside of the cabinet and the liquid line has a refrigerant shut-off valve. Suction and liquid lines have service ports for charging hose connection.

Controls: Internally wired controls include the 5-minute compressor anti-short cycle timer, fan relay and the compressor motor contactor(s). The 24-volt control circuit includes a transformer and low voltage terminal board for ambient air thermostat.

Required Refrigerant Circuit Options

Hot gas bypass

Hot gas reheat

For long ling applications an optional liquid receiver is available to ensure correct oil charge at the compressor.

2.12 CONTROL OPERATIONS

- A. General space temperature shall be controlled by wall mounted thermostats located within the spaces as indicated on drawings. Thermostats shall be 7-day programmable (auto change over) and have battery back-up with night low and high limit settings. Thermostats shall have auxiliary output signal for control of a motorized damper in the outdoor air.
- B. All controls shall be furnished and installed by Gulf Power's designated DDC Controls Contractor. Contact Gulf States Automation for pricing of controls for this project.

- C. Wiring: All control wiring external to the A/C equipment shall be installed by the control subcontractor under the direct supervision of the HVAC subcontractor.

Note: All wiring required for equipment operations shall be by the electrical Contractor. Controls Contractor shall provide all conduit as required for control wiring.

- D. Test all units for two 8-hour days under the supervision of manufacturer's representative, who shall make all necessary adjustments and instruct designated operating personnel in operation and maintenance of equipment and controls.

2.13 CONTROLS

- A. The facility shall include new DDC controls installed by Trane and connected to the existing Trane server serving Escambia County facilities. The Trane system shall also connect to the controls provided as part of the variable refrigerant flow (VRF) systems and shall provide scheduling as well as set points to the VRF system. The controls shall also receive temperatures and status indicators from the VRF system.
- B. Contractor shall furnish and install all relays, transformers, contacts, etc., as required to control automatically the heating and air conditioning equipment. Submit control drawings for approval. Control drawings shall be complete and shall indicate complete control sequence of operation.
- C. All control wiring shall be installed in conduit and shall be sized as recommended by unit manufacturer. All wiring shall be color coded to match system wiring diagrams and shall be installed in accordance with the electrical section of this specification.

2.14 ELECTRICAL DUCT HEATERS - AUXILIARY TYPE

- A. Electrical duct heaters shall be factory installed and shall be furnished complete with air limiting and safety devices as required by National Electrical Code. Units shall bear UL approval for use in indoor A/C unit. Size of electric heater shall be as scheduled on the drawings including number of steps, voltage, and KW.

2.15 DRAIN CONNECTIONS

- A. Provide drain connection with 3" deep seal trap for all air conditioning units. Drain piping shall be Type "M" copper pipe with drainage pattern fittings and solder type joints. Piping shall be insulated with 3/8" wall fire retardant closed cell elastomeric insulation slipped over piping. Provide fire safing and sleeves at floor penetrations.

2.16 CEILING EXHAUST FANS

- A. All fans shall bear the AMCA Seal of Approval and shall be currently listed in the AMCA Directory. Vibration isolators shall be provided for all suspended fans.
- B. Ceiling Mounted Exhaust Fan: Ceiling cabinet type fans shall have 1/2" thick acoustical lined steel housing, direct drive centrifugal fan, backdraft damper, and integral aluminum ceiling grille. No plastic grilles will be acceptable. Fans shall be designed for ceiling mounting with

exhaust duct termination where indicated. Fans shall have capacities as scheduled on drawings and shall be controlled as indicated. Fan discharge shall be through weather-tight wall boxes with recessed back draft dampers and discharge louvers as shown on plans.

2.17 LOW PRESSURE DUCTWORK

- A. The sizes, runs and connections of ducts shall be as indicated. Adhere to drawings as closely as possible. The right is reserved, however, if required to meet structural or other interferences, to vary run and shape of ducts and offsets during progress of work, at no extra cost to the Owner. Ductwork specified herein shall have rectangular cross section, unless otherwise indicated.
- B. Materials - Methods of Construction: Details of construction and materials not specified herein shall be in accordance with SMACNA Low Velocity and ASHRAE "Guide" recommendations. Fabricate ductwork in workmanlike manner with airtight joints presenting smooth surface on inside, neatly finished on outside. Seal all duct joints airtight before insulation is applied. Construct ductwork air extractors, spin-in taps with air scoops, turning vanes, splitter dampers, etc., to ease air flow and balancing of air. Unless otherwise indicated, where square elbows have to be used, provide fixed deflectors. Construct, brace and support ducts in manner that they will not sag or vibrate to any perceptible extent when fans are operating at maximum speed and capacity. Duct sizes indicated on drawings are net inside free area and must be increased for total insulation thickness as specified. Ductwork shall be G90 galvanized sheet steel unless otherwise specified. Distance between joints of any size duct shall not exceed 8 feet.
- C. Flexible ductwork shall not exceed 8' in length, be equal to Thermaflex type M-KE with 1"-1 lb. density insulation with metalized film vapor barrier, and conform to UL-181 as a Class I duct.
- D. The following weights of materials, types of joints and bracing shall be followed for sheet metal ductwork.

Steel U.S. Std. Gauge	Maximum Size Inches	Type of Transverse Joint Conn.	Bracing
26	Up to 12	S-Drive, pocket or bar clips, on 7'-10" centers	None
24	13 to 24	S-Drive, Pocket or bar Clips on 7'-0" centers	None
24	25 to 40	S-Drive, Pocket or bar Clips on 7'-0" centers from joint	1"x 1"x1/8" angle 4'-0"
22	41 to 60	1-1/2" Pocket or 1-1/2" bar slip with 1-1/4" x 1/8" bar reinforcing from on 7'-0" centers reinforcing joint	1-1/2" x 1-1/2" angle 4'0"

- E. Exhaust duct from the kitchen hood shall be 18-gauge, welded steel sloped back to the hood. Duct shall be liquid tight and shall comply with NFPA-96.

2.18 DUCT SUPPORT

- A. Support horizontal ducts with hangers spaced not more than 8 feet apart, place hangers at changes in directions. Use strap hangers for ducts up to 30" wide, angle hangers for ducts over 30" wide. Make strap hangers 1" by 16-gauge minimum, extended down both sides of duct and turn under bottom 2" minimum, fasten sides and bottom with sheet metal screws. Use hanger rods per SMACNA standards for exposed duct in Tennis Court Area.
- B. The following details of duct construction shall be adhered to without deviation:
 1. All uninsulated ducts over 18" and over shall be cross broken.
 2. Longitudinal seams for metal shall be Pittsburgh lock. All seams shall be mechanically fastened, duct tape is not acceptable.
 3. Horizontal ducts shall be hung at intervals not exceeding 8'-0" with 18-gauge galvanized iron hangers extending the full height of the duct. Support ductwork from structural steel beam clamps attached to beams, channels, joists, etc. Where suspended from concrete slabs, install insets of malleable iron during building construction. Do not support ductwork by or from ceilings or furring members.
 4. All ductwork shall be fabricated in strict accordance with SMACNA Construction Standards for Low Velocity Ductwork.
 5. All sheet metal duct connections to indoor air handling units, fans, etc., shall be made through a 4" flexible connection. (Not required for ductboard.)

2.19 DAMPERS

- A. Manual Volume Dampers: Dampers shall be similar to Arrow or American Warming and Ventilating, Inc., Model DAA-P-10 opposed blade type with operator and locking quadrant.
- B. Dampers of same materials as duct, at least one gauge heavier than duct, reinforced where directed, shall have an accessible location indicating quadrant, locking device for adjusting and locking dampers in position.
- C. Stiffen duct at damper location, install damper in manner to prevent rattling.
- D. Fire Dampers: Shall be curtain type with fusible link. Curtain shall be mounted out of air stream. Dampers shall be furnished and installed at locations shown on plans. Fire dampers shall be constructed and tested in accordance with UL Safety Standard 555. Each fire damper shall have 165°F fusible link and shall include a UL label in accordance with established UL labeling procedures. Fire dampers shall be equipped for installation as required by the location shown. Fire dampers shall be installed in openings utilizing steel sleeves, angles, other materials, and practices required to provide an installation equivalent to that utilized by the manufacturer when dampers were tested at UL. Installation shall be in accordance with the damper manufacturer instructions. Fire dampers shall be Ruskin Type IBD2 or equal by Air Balance, Greenheck, Karp, Metal Manufacturing, or United Air.
- E. Fire dampers for horizontal duct mounting shall be same as vertical dampers described above except provided with spring loaded actuator.

2.20 GRILLES AND DIFFUSERS

- A. Diffusers, registers and grilles for non-rated ceilings shall be all aluminum construction, with key operated opposed blade dampers. Air devices located in 1-hour rated ceilings shall be all steel construction. Grilles and registers installed in indoor pool area shall have a chlorine resistance coating.
- B. Air distribution devices shall be Titus, Carnes, Krueger, or approved equal. Location of ceiling registers and diffusers shall be as shown on reflected ceiling plan. Finish shall be baked off white enamel.
- C. Ceiling diffusers shall be louvered face equal to Titus Model TDC with opposed blade damper.
- D. Return air, transfer, and exhaust registers shall be egg crate type equal to Titus 50F Series.
- E. Install and fasten ceiling diffuser and return air grilles as per manufacturer's detailed drawings, use gaskets to make airtight flush joints with adjoining construction, join neatly with adjoining finished surface.

2.21 DUCT INSULATION

- A. Wrap all supply, return, exhaust and outside air ductwork with 2" thick, 1 lb. density foil faced duct wrap with minimum R-6 (installed) value. Installation shall be in accordance with manufacturer's printed instructions. Vapor barrier jacket shall be thoroughly sealed with approved mastic over all taped joints. All ducts shall be leak tested prior to installation of duct wrap insulation. Duct hangers shall be installed per applicable SMACNA construction standards.

2.22 LOUVERS

- A. Louvers shall be stationary type. Furnish and install louvers as hereinafter specified where shown on plans. Louvers shall be "Wind Driven Rain Resistant Hurricane" type with a drain gutter in each blade and down spots in jambs and mullions. Stationary drainable blades shall be contained within a single 6" frame.
- B. Louver components (heads, jambs, sills, blades, and mullions) shall be factory assembled by the louver sections to provide overall sizes required.
- C. Construction shall be of extruded aluminum alloy as follows:
 - Frame: .095" wall thickness
 - Blades: .062" wall thickness at 372E angle on approximately 4 1/2" centers
 - Screen: 1/2" x .063" expanded flattened aluminum in removable frame.
 - Wind Loads: Basic Wind Speed: 135 mph(60 m/s)
 - Importance Factor: 1.15.
 - Exposure Category: B.
- D. SUBMITTALS - Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of louver assembly.
 - 1. Wind-Borne Debris B Impact Resistance Performance: Notice of Acceptance from Miami-Dade Building Code Compliance Office or Certification of Compliance

- from other testing laboratories approved by the State of Florida under the Florida Building Code.
 - 2. AMCA 540 listed for wind borne debris impact resistance.
 - 3. AMCA 550 listed for high velocity rain resistance.
- E. QUALITY ASSURANCE - Louver units indicated for exterior locations shall be designed to comply with the requirements of the High-Velocity Hurricane Zone of the 2014 Florida Building Code.
- F. ALUMINUM FINISHES - High-Performance Organic Finish: 3-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.
- G. Published louver performance data bearing the AMCA Certified Ratings Seal for Air Performance & Water Penetration must be submitted for approval. Provide birdscreen and flanged frame. Provide baked enamel finish with color as selected by Architect.
- H. Louvers shall be Ruskin Model EME6325D or equal by Pottorf, American Warming, Arrow United Industries, Greenheck, Industrial Louvers, Louvers and Dampers, or Nailor-Hart.

2.23 AUTOMATIC SHUT-DOWN

- A. Air conditioning equipment shall have smoke detectors installed in supply and return air duct. Mechanical contractors shall install smoke detectors provided by electrical contractor under Division 26 – Electrical and Division 28 – Electronic Safety and Security. Smoke detectors shall be for automatic shut-down of unit.

PART 3 – EXECUTION

3.1 GUARANTEE

- A. The Contractor shall guarantee, in writing, the entire system when completed to be free from any and all defects and shall guarantee the entire system, controls and other equipment against defective materials and workmanship for a period of one (1) year from date of completion and acceptance.
- B. Upon receipt of notice from the Owner of the failure or any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be promptly repaired or replaced with new parts by and at the expense of the Contractor.
- C. Under the guarantee clause, the Contractor shall include free routine maintenance for a period of one (1) year from the date of final acceptance.

3.2 FIELD BALANCING AND ADJUSTING

- A. See Specification Section 15200 – Testing and Balancing Air Distribution Systems for details on testing and balancing.

END OF SECTION

SECTION 16100 – ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General and/or Special Conditions Sections are a part of this specification and the Contractor shall consult them in detail for instructions pertaining to this work. Section 16 is sub-divided for convenience only.

1.2 SCOPE

- A. Furnishing of all labor, material, equipment, supplies, and services necessary to construct and install the complete electrical systems as shown on the drawings and specified herein. Work shall include but is not necessarily limited to the following items:

- Demolition
- Service
- Grounding
- Surge Protection Device (SPD)
- Interior Distribution/Branch Circuits
- Lighting
- Equipment Connections
- Fire Alarm
- Telecommunication Systems

1.3 JOB CONDITIONS

- A. Site Inspections: Before submitting proposals, each bidder should visit the site and should become familiar with all job conditions and shall be fully informed as to the extent of the work. No consideration will be given after bid opening date for alleged misunderstanding as to the requirements of work involved in connecting to the utilities, as to requirements of materials to be furnished, or as to the extent of demolition required.
- B. Existing Conditions: All utilities, existing systems, and conditions shown on the plans as existing are approximate, and the Contractor shall verify before any work is started.
- C. Scheduled Interruptions: Planned interruptions of utilities service, to any facility affected by this contract, shall be carefully planned and approved by the Architect at least ten (10) days in advance of the requested interruption. The Contractor shall not interrupt services until specific approval has been granted by the Architect. The request shall indicate services to be affected, date and time of interruption and duration of outage. Request for interruption of service will not be approved until all equipment and material required for the completion of that particular phase of work are on the job site. The work may have to be scheduled after normal working hours.
- D. Maintaining Service: Any existing service (or operating system) which must be interrupted for any length of time shall be supplied with a temporary service as necessary for continuation of the normal operation of this facility.

- E. Removal of Existing Work: Where noted or indicated on the drawings, or specified herein, existing electrical materials and equipment shall be removed from the building. All materials designated to be removed by the Contractor, and not required to be reinstalled, including scrap, shall become the property of the Contractor, and shall be promptly removed from the site. Hazardous materials shall be disposed of in approved hazardous material disposal facility. Existing items required to be removed temporarily in order to properly install new work shall be replaced in a satisfactory manner upon completion.

1.4 TEMPORARY POWER

- A. Furnish and maintain temporary wiring system for light and power for use during construction by all trades. Use solidly grounded system. Limit over-current protection to 20 amperes on No. 12 conductors. Pay for all charges incurred while furnishing power for construction. Verify whether charges for electrical power consumption are specified in Division One; if so, payment of bills for power consumption are not included under this section.
- B. Accidental Interruptions: All excavation and/or remodeling work required shall be performed with care so as not to interrupt other existing services (water, gas, electrical, sewer, sprinklers, etc.). If accidental utility interruption resulting from work performed by the Contractor occurs, service shall be immediately restored to its original condition without delay, by and at the expense of the Contractor, using skilled workmen of the trade required.

1.5 CODES, PERMITS AND INSPECTIONS

- A. The installation shall comply with all local, state, and federal laws and ordinances applicable to electrical installation and with the regulations of the latest published edition of the National Electrical Code (N.E.C.) where such regulations do not conflict with those laws and ordinances. The Contractor shall obtain and pay for all permits and inspection fees, and after completion of the work, shall furnish the Architect a certificate of final inspection and approval from the applicable local inspection authorities. Any charges by a utility for providing service as shown shall be included in the bid and paid by the Contractor.

1.6 DRAWINGS AND SPECIFICATIONS

- A. The drawings and these specifications are complimentary each to the other. What is called for by one shall be as binding as if called for by both. Where the drawings and/or specifications differ as to quantity or quality, the greater quantity or higher quality shall be provided. Omissions from the drawings and specifications of details of work which are evidently necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such work. In any case of discrepancy in the figures or catalog numbers, the matter shall be submitted to the Architect, who shall promptly make a determination in writing. Any adjustment by the Contractor shall be at the Contractor's own risk and expense. Electrical drawings are diagrammatic only. Do not scale these drawings. All equipment shall be installed in accordance with manufacturer's recommendations and any conflicting data shall be verified before bidding.

1.7 STANDARDS OF MATERIALS AND WORKMANSHIP

- A. Materials: All materials shall be new and shall be listed and approved by the Underwriters'

Laboratories, Inc., in every case where a standard has been established for a particular type of material in question. All work shall be executed in a workmanlike manner and shall present a neat appearance.

- B. Prior Approvals: Equipment and materials of the same type or classification and used for the same purpose, shall be products of the same manufacturer. It is the intention of these specifications to indicate a standard of performance and quality for all materials incorporated in this work. Manufacturer's names and catalog numbers are used to designate the item of equipment or material as a means of establishing grade and quality. Where several manufacturers are named, only those named manufacturers' products will be considered and the Contractor's bid shall be on their products. The first named of several manufacturers is the manufacturer whose product was used in engineering the project. Other named manufacturers, although acceptable as manufacturers, shall guarantee that their product will perform as specified and will meet space requirements. Where performance characteristics of such equipment differs from the equipment scheduled on the drawings, the Architect shall reserve the right to reject it. Where use of such equipment requires different quantity or arrangement of foundations, supports, ductwork, piping, wiring, conduit and any other equipment, the Contractor shall furnish said changes and additions and pay all costs for all changes to the work and the work of others affected by using such equipment.
- C. For approval of products other than those specified, bidders shall submit to the Architect, a request in writing, at least ten (10) days prior to bid date. Requests received after this time will not be reviewed or considered regardless of cause. Requests shall clearly define and describe the product for which approval is requested. Requests shall be accompanied by manufacturer's literature, specifications, drawings, cuts, performance data, model numbers, list of references or other information necessary to completely describe the item. Approval will be in the form of an Addendum to the specifications issued to all prospective Prime Contract Bidders on record. The Addendum will indicate the additional products which are approved for this project.
- D. If a bidder proposes to use substitute materials or equipment for the following items, he shall obtain a minimum of ten (10) days before Bid "Prior Approval" or longer as described in "Instructions to Bidders" for the items indicated below:
 - 1. Panelboards.
 - 2. Enclosed circuit breakers
 - 3. Safety switches.
 - 4. Motor starters.
 - 5. Lighting controls.
 - 6. Lighting fixtures.
 - 7. Fire alarm system.
- E. Approval on other items shall be handled in the normal manner, as described in "Instructions to Bidders", under the heading "Approval of Materials".
- F. Substitutions: Reference to a particular product by manufacturer, trade name, or catalog number establishes the quality standards of material and equipment required for this installation and is not intended to exclude products equal in quality and similar design. The Architect reserves the sole right to decide the equality of materials proposed for use in lieu of these specified. It shall be the Contractor's responsibility to furnish the information and data sufficient to establish the quality and utility of the items in question, including furnishing samples if required.

- G. Shop Drawings: The Contractor shall submit a list of items proposed for use. He shall also submit catalog data and shop drawings on proposed systems and their components, panelboards, safety switches, starters and contactors, transformers, lighting fixtures, and wiring devices. Where substitutions alter the design or space requirements, the Contractor shall defray all items of cost for the revised design and construction including costs to all allied trades involved. Data shall be submitted within ten (10) calendar days after the contract is awarded. Provide six (6) copies of shop drawings unless a greater number of copies is required by the General Conditions. Each submittal data section shall be covered with an index sheet listing Contractor, Sub-Contractor, Project Name, and an index to the enclosed submittals.
- H. Each major section of submittals such as power, equipment, lighting equipment, fire alarm, etc., shall be secured in a booklet or stapled with a covering index which lists the following information:
 - 1. General contractor with phone number and project manager.
 - 2. Subcontractor with phone number and project manager.
 - 3. Supplier of equipment with phone number and person responsible for this project.
 - 4. Index of each item covered in submittal and model number as proposed in the attached.
 - 5. Any deviation from contract documents shall be specifically noted on submittal cover index and boldly on specific submittal sheet.

1.8 TYPE OF PERMANENT ELECTRICAL SERVICE

- A. Electrical service shall be 208 volts, 3-phase, 4-wire served from an underground utility service. Contractor shall verify all details of electrical service with the serving utility company prior to bid. Contractor shall include any and all costs associated with the service in his bid price and shall pay these costs to the serving utility company.

1.9 DOCUMENTATION

- A. Operating and Maintenance Manuals: At completion of the work, furnish three (3) copies of written operation instructions which shall include manufacturer's descriptive bulletins, operating and maintenance manuals and parts lists of all equipment installed. Also include in such instructions, the specified size and capacity ratings of all equipment installed. Each set of instructions shall be assembled into a suitable looseleaf type binder and presented to the Architect for delivery to the Owner.
- B. Record Drawings: Maintain one extra set of black-line, white print drawings for use as record drawings. Records shall be kept daily, using colored pencil. As the work is completed, relevant information shall be transferred to a reproducible set, and copies made to be given to the Architect.
- C. Comply with the following for all work specified in this document. As-built information shall be shown to scale, using standard symbols listed in the legend. As a minimum, show the following:
 - 1. Location of stub-outs dimensioned from permanent building lines.
 - 2. Location and depth of under-slab and in-slab raceways.
 - 3. All routing of raceways.
 - 4. Corrected panelboard and equipment schedules.

5. Corrected circuit numbers as they appear on panelboard directories.
6. Corrected motor horsepower and full load amperages.
7. Number, size, type of insulation, and number of wires in each conduit or multiconductor cable whether in conduit or exposed.
8. Location of junction boxes and splices.
9. Location of access panels.

1.10 INTERFACE WITH OTHER CONTRACTS

- A. It shall be the responsibility of the Contractor to cooperate with all other crafts working on this project. All cutting, trenching, backfill, and structural removals to permit entry of the electrical system components shall be done by this Contractor. All patching and finishing shall be done by the General Contractor.
- B. This Contractor shall furnish and install all conduit and pull strings for control wiring provided under other contracts. Control wire conduit requirements shall be coordinated with the proper trade.

1.11 EQUIPMENT FURNISHED UNDER OTHER SECTIONS

- A. This Contractor shall furnish and install complete electrical roughing-in and connection to all equipment furnished under other sections as indicated on drawings. All such equipment shall be set in place as work of other sections.

1.12 EQUIPMENT CONNECTIONS

- A. In general, provide electrical power and control systems connections to all equipment shown on drawings. Included are wiring raceways, disconnects, starters, and other devices shown. Excluded are devices furnished integrally with the manufacturer's package and work specified in other sections of these specifications.
- B. Residential appliances are furnished with cords, cord caps, and will be set in place by contractors performing work under other divisions of specifications. Packaged air conditioning units are all with starters and contactors. Provide disconnecting means and connect. Low voltage control of these devices is specified for installation in Division 15.

1.13 GROUNDING

- A. Provide grounding and bonding systems in strict accordance with the latest published edition of N.E.C., except where more stringent requirements are specified herein. Inter-connection of neutral and ground is not permitted except at service entrance equipment. Install grounding conductors to permit shortest and most direct path to ground. Concealed joints shall be made by Cadweld method. Where grounding conductors are in raceway, bond conductor and raceway at both ends. Grounding and bonding fittings used shall be UL listed and be compatible with metals used in system. Sheet metal type strap are not acceptable.
- B. Service entrance ground electrode system shall consist of driven electrodes, connection to water piping, and building grounding grid, as required by NEC Article 250-50. Unless otherwise shown on drawings, each driven electrode shall consist of one 3/4 inch diameter 10 ft. long

copperweld steel rod. Rod made of wrought iron may be used in lieu of copperweld at option of contractor. Water pipe connection shall be made to a minimum one inch diameter metallic cold water pipe. Extend grounding conductor to main telephone equipment space. Interconnect conduits entering and leaving service entrance equipment using grounding bushing and copper.

- C. A green insulated ground conductor shall be run in all branch circuit and feeder conduit with phase and/or neutral conductors. Ground conductor shall be sized per NEC or as noted on drawings. Minimum size #12 AWG. Conduit box to device strap or yoke screw connection is not sufficient. Provide an insulated grounding jumper for receptacle circuits.

1.14 GUARANTEE AND SERVICE

- A. Upon completion of all tests and acceptance, the Contractor shall furnish the Owner of a written guarantee covering the electrical work done for a period of one (1) year from date of acceptance. Guarantee includes equipment capacity and performance ratings specified without excessive noise levels. Upon notice from the Architect or the Owner, the Contractor shall, during the guarantee period, rectify and replace any defective material or workmanship and repair any damage caused thereby without additional cost.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All equipment and materials shall have ratings established by the recognized independent agency or laboratory. The Contractor shall apply the items used on the project within the ratings and subject to any stipulations or exceptions established by the independent agency or laboratory. Use of equipment or materials in applications beyond that certified by the agency or beyond that recommended by the manufacturer shall be cause for removal and replacement of such misapplied items.

2.2 PANELBOARDS

A. General

1. The Contractor shall furnish and install the panelboards as specified and as shown on the contract drawings.
2. The panelboards and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of NEMA and UL as follows:
 - a. UL 67 -- Panelboards
 - b. UL 50 -- Cabinets and boxes
 - c. NEMA PB1
 - d. Fed. Spec. W-P-115C
 - e. Circuit breaker -- Type I class I
3. The manufacturer of the panelboard shall be the manufacturer of the major components within the assembly, including circuit breakers and fusible switches.

- B. Ratings - Panelboards shall be fully rated to the short-circuit rating indicated on the drawings.

C. Construction

1. Interiors shall be completely factory assembled devices. They shall be designed such that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors.
2. Trims for lighting and appliance panelboards shall be supplied with a hinged door over all circuit breaker handles. Doors in panelboard trims shall not uncover any live parts. Doors shall have a semiflush cylinder lock and catch assembly. Doors over 48 inches in height shall have auxiliary fasteners.
3. Distribution panelboard trims shall cover all live parts. Switching device handles shall be accessible.
4. Surface trims shall be same height and width as box. Flush trims shall overlap the box by 3/4 of an inch on all sides.
5. A directory card with a clear plastic cover shall be supplied and mounted on the inside of each door.
6. All locks shall be keyed alike.

D. Bus

1. Main bus bars shall be plated copper sized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum.
2. A bolted ground bus shall be included in all panels.
3. Full-size (100%-rated) insulated neutral bars shall be included for panelboards shown with neutral. Bus bar taps for panels with single-pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection.

E. Circuit Breakers

1. Molded case circuit breakers shall provide circuit overcurrent protection with inverse time and instantaneous tripping characteristics. Ground fault protection shall be provided where indicated.
2. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be nonwelding silver alloy and arc extinction shall be accomplished by means of arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.
3. Provide shunt trips, bell alarms, and auxiliary switches as shown on the contract drawings.

F. Enclosure shall be at least 20 inches wide made from galvanized steel. Provide minimum gutter space in accordance with the National Electric Code. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be sized to include the additional required wiring space. At least four interior mounting studs with adjustable nuts shall be provided. Enclosures shall be provided with blank ends.

G. Nameplates - Provide a mechanically fastened engraved phenolic nameplate for each panel section.

H. Finish - Surfaces of the trim assembly shall be properly cleaned, primed, and a finish coat of gray ANSI 61 paint applied.

2.3 SURGE PROTECTIVE DEVICES (SPDs)

- A. General - This section describes the quality, performance, and installation of AC Power, Panel Type, Surge Protective Devices (SPDs).
- B. Quality Assurance: All Surge Protective Devices (SPDs) shall be tested and *listed* to *ANSI/UL 1449-2006 (UL 1449 3rd Edition)* and Complimentary Listed to UL 1283 by an independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a Nationally Recognized Testing Laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction. This agency must comply with ANSI/IEEE C62.45 test procedures for all categories established in C62.41 (1991). "Manufactured in accordance with UL 1449" is not equivalent to being listed to ANSI/UL 1449-2006 and does not meet the intention of this specification. The UL 1449 suppression voltage ratings (SVR) label shall be permanently affixed to the SPD unit.
- C. Codes and Standards:
 1. ANSI/IEEE Std C62.41.1™-2002, IEEE Guide on the Surge Environment in Low- Voltage (1000 V and Less) AC Power Circuits
 2. ANSI/IEEE Std C62.41.2™-2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
 3. ANSI/IEEE Std C62.45™ -2002, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits
 4. ANSI C84.1, American National Standard for Electric Power Systems and Equipment – Voltage Ratings (60 Hertz)
 5. ANSI/IEEE Standard 1100-2005, IEEE Recommended Practice for Power and Grounding Electronic Equipment (Emerald Book) – Clause 8.6.1
 6. National Fire Protection Association (NFPA) 70 (N.E.C.) – 2002 – Article 285
 7. ANSI/UL Standards 1449-2006 Listed (UL 1449 Third Edition), UL 1283 Listed, CUL Listed & CE compliant "low-voltage directive."
 8. IEEE Standard C62.72™ - 2007 – IEEE Guide for the Application of Surge-Protective Devices for Low-Voltage (1000 V or less) AC Power Circuits
- D. Manufacturer Qualifications:
 1. All SPDs at the service entrance, distribution panels, and sub-panels shall be from the same manufacturer
 2. All surge suppression devices shall be manufactured by an ISO 9001-2000 certified company normally engaged in the design, development, and manufacture of such equipment, with at least 10 years of engineering experience in the design and manufacture of permanently connected SPD devices.
 3. Subject to compliance with specification requirements, provide products equivalent to Surge Suppression Incorporated.
- C. Warranty:
 1. All SPD devices shall be warranted to be free from defects in materials and workmanship under normal use in accordance with the instructions provided for a period not less than Ten (10) years from date of substantial completion.
 2. Any SPD device that shows evidence of failure or incorrect operation, including damage as the result of lightning strikes, during the warranty period shall be replaced as a

complete unit (not just modules, subassemblies, or components) by the manufacturer at no charge to the owner.

- D. Enclosures: Unless otherwise noted, provide NEMA 1 or better enclosure for indoor mounting and NEMA 4 enclosure or better for all outdoor locations.
- E. Maintenance Restrictions: No suppression unit shall be supplied which requires scheduled preventive maintenance or replacement parts. Units requiring functional testing, special test equipment, or special training to monitor surge protection device (SPD) status are not acceptable. SPD shall require NO routine maintenance.
- F. Installation:
 - 1. SPDs located integral within the switchboard or panelboard(s) shall expressly meet or exceed ALL parameters of this specification for the SPDs. These SPDs shall be individually tested and Listed to ANSI/UL 1449-2006 according to their type and not be listed solely as part of the larger assembly. Externally mounted SPDs shall be located immediately adjacent to the switchboard or panelboard being protected.
 - 2. Do not energize or connect service entrance equipment and panelboards to their sources until SPDs devices are properly installed and connected.
 - 3. Do not perform insulation resistance tests of the distribution wiring equipment with the SPD installed.
 - 4. Install the SPD with #10 AWG minimum conductors to dedicated 30-amp breaker(s) in panel per manufacturer's installation instructions and close to the Neutral Bus. The dedicated breaker shall serve as a means of service disconnect for the SPD so that the electrical panel remains energized during SPD servicing. The installer may rearrange breaker locations to ensure the shortest and straightest leads to the SPD. If a dedicated breaker is not provided, an SPD with internal 30-amp fuse or a UL Listed fused disconnect switch shall be installed as a minimum. The conductors serving the SPD shall be twisted together (one twist per 12" of wire) to reduce the SPD system input impedance and shall be kept at the minimum length. The SPD shall be installed in strict accordance with the manufacturer's recommended practices and in compliance with N.E.C. requirements, State, and Local Codes.
 - 5. If any lead lengths exceed 18", the Contractor responsible for installation *must* contact the specifying electrical engineer and the surge suppression manufacturer or distributor for installation assistance.
 - 6. The electrical contractor shall verify the proper application of the SPD (i.e., voltage, phases, etc.). The electrical contractor shall ensure that all Neutral conductors are bonded to the system Ground at the service entrance or the serving isolation transformer prior to installation of the associated SPD. The electrical contractor will ensure that neutral-to-ground bonds do not exist at locations that are not service entrances or newly derived power sources.
 - 7. The SPD installation shall be certified by a licensed electrician that the installation is in accordance with the manufacturer's recommendations, applicable electrical code requirements and the requirements of the specification above. Any deficiencies noted shall be corrected by the Contractor. Provide written documentation of this inspection as part of the closeout documentation

2.4 SAFETY SWITCHES

- A. General - The Contractor shall furnish and install the low-voltage fused and non-fused switches as specified herein and as shown on the contract drawings.

- B. Provide heavy duty switches as shown on drawings, with the following ratings:
 - 1. 30 to 1200 amperes
 - 2. 250 volts AC, DC; 600 volts AC (30A to 200A 600 volts DC)
 - 3. 2, 3, 4, and 6 poles
 - 4. Fusible and non-fusible
 - 5. Copper/aluminum standard mechanical lugs.
- C. Construction - Switch blades and jaws shall be plated copper. Switches shall have a handle that is easily padlockable in the OFF position. Switches shall have defeatable door interlocks that prevent the door from opening when the handle is in the ON position. Switch assembly and operating handle shall be an integral part of the enclosure base. Switches rated 100A to 600A shall have reinforced fuse clips. Switch blades shall be readily visible in the OFF position. Switch Operating mechanism shall be non-teasible, positive quick-make/quick-break type.
- D. Enclosures. - All enclosures shall be NEMA 1 general purpose unless otherwise noted.
- E. Nameplates - Nameplates shall be phenolic type, front cover mounted, contain a permanent record of switch type, ampere rating, and maximum voltage rating. Nameplates shall be mechanically fastened.

2.5 WIRING METHODS

- A. Conduit Systems: Acceptable types of conduit:
 - 1. Hot dipped galvanized rigid steel (GRS) - Shall be galvanized steel, protected inside and outside.
 - 2. Electrical Metallic Tubing (EMT) - Shall be steel, protected inside and outside by a coating of approved corrosion-resistant material such as zinc or cadmium.
 - 3. Rigid Nonmetallic - Shall be polyvinyl chloride (PVC), schedule 40 or schedule 80, as indicated on the drawings.
 - 4. Flexible Metallic Conduit (½" min. trade size) (FLEX) - shall be galvanized steel, protected inside and outside.
 - 5. Liquid Tight Flexible Metallic Conduit (½" min. trade size) (LQFLEX) - shall be galvanized steel, protected inside and outside with an extruded outer liquid tight, non-metallic, sunlight resistant jacket. Use with standard liquid tight fittings.
- B. Raceway Fittings:
 - 1. Rigid Metal Conduit - Shall have threaded fittings, galvanized steel or threadless compression galvanized steel or threadless compression cadmium plated malleable iron. Fittings shall be rain tight/concrete tight.
 - 2. Electrical Metallic Tubing (EMT) - Material of steel or malleable iron is acceptable. Couplings and connectors shall be concrete and rain tight, with connectors having insulated throats. Use gland and ring compression type couplings and connectors for conduit sizes 2" and smaller. Use set screw type couplings with four set screws each for conduit sizes over 2". Use set screws of casehardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding. Indent type connectors or couplings are prohibited. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are prohibited.

3. Rigid Non-Metallic Conduit - shall have polyvinyl chloride (PVC) fittings suited for the purpose and joined together by a method approved for the purpose. Schedule 80 conduit sections may be joined together with threaded fitting connectors.
 4. Flexible Metal Conduit - fittings shall be zinc plated steel or cadmium plated malleable iron screw type with insulated throat and angular wedge fitting between convolutions of conduit.
 5. Liquidtight Flexible Metal Conduit - fittings shall be cadmium plated, malleable iron or steel with compression type steel ferrule and neoprene gasket sealing rings, with insulated throat.
 6. Wireway fittings shall be steel with rust resistant undercoat and finish coat to match the wireway. The fittings shall be so designed that the sections can be electrically and mechanically fitted together to form a complete system. Dead ends shall be closed.
 7. Couplings and Unions shall be galvanized steel, tapered thread standard conduit couplings for intermediate metal conduit and rigid metal conduit. PVC couplings for rigid non-metallic conduit shall use approved adhesive, and threaded couplings shall be used for schedule 80 conduit. Split couplings shall be galvanized steel. Unions shall be ground joint type galvanized steel.
- C. Conduits installed concealed in earth fill, concrete or, solid masonry structures shall be PVC 40, 3/4" minimum. PVC shall not be installed in any exposed locations. All exposed exterior conduits shall be GRS. Any GRS installed below grade or in concrete shall have two coats of bitumastic applied prior to installation. See paragraph "E" for EMT requirements.
- D. Conduits used for connection to recessed lighting fixtures shall be FLEX not over 6 feet in total length. Conduits for connection to motors or vibrating equipment shall be LQFLEX not less than 18" long and not over 60" long.
- E. Conduits run concealed in the hollow space of non-masonry walls or, above suspended/hard ceilings shall be EMT. Exposed conduits shall be run at right angles to or parallel with building lines and exposed structure. In all cases, conduit runs shall be grouped together where possible and shall be supported from the building structure, not from any suspended ceiling support system.
- F. PVC 80 shall not be used unless specifically indicated on the drawings. Where approved for installation, install conduits passing through building sidewalls or through beams below grade with expansion/deflection fittings. Install expansion fittings where conduit crosses an expansion joint. Where conduit penetrates damp-proofing membranes, cut the membrane carefully around the conduit and seal the joint with pressure sensitive tape.
- G. Support raceways securely with pipe straps, wall brackets, conduit hangers or ceiling trapeze. Fastenings shall be by wood screws or screw type nails to wood, by toggle bolts to concrete block, expansion bolts on concrete or brick, and beam clamp types on steel or bar joists. Raceways shall not be fastened to suspended ceiling supports but must have independent support from the structure. Supporting devices shall be of materials having corrosion protection at least equal to the raceway. A support shall be provided as close as practical to, and not exceeding 18" from an unsupported box or from change of direction. In horizontal runs, this support may be omitted if the box is independently supported and the box connection is not made with chase nipple or threadless box connector. In vertical runs, load produced by weight of the raceway and conductors shall not be carried by the raceway terminal, but must be carried entirely by conduit supports. Install conduit supports in strict accordance with the following table, except as required by support for boxes and changes in direction:

MAXIMUM SUPPORT TRADE SIZE	LOCATION OF RUNS	SPACING
1/2, 3/4	Exposed, Horizontal	7 feet
1 and larger	Exposed, Horizontal	10 feet
All sizes	Concealed, Horizontal	10 feet
1/2, 3/4	Exposed, Vertical	7 feet
1, 1 1/4	Exposed, Vertical	8 feet
1 1/2 and larger	Exposed, Vertical	10 feet
All sizes	Concealed, Vertical	10 feet

- H. For conduit runs that are not sized on drawings, the maximum conduit fill shall be computed using the requirements for Type THW conductors although the actual wiring is with Type THWN or other type of conductors having smaller cross-sections. This requirement is made to provide spare conduit capacity.
- I. Install all required sleeves for conduits passing through concrete slabs. Fire proof space between conduit and sleeve after installation using mineral wool.
- J. Bushings: Shall be provided at the end of all conduits prior to pulling cables to protect the insulation of the conductor. Provide grounding bushings for metal raceways, boxes, and cabinets to ensure that all metallic surfaces are effectively grounded. Metallic raceway may be bonded to cabinets, boxes and panelboards by double locknut and bushing to ensure the metallic parts are all effectively grounded.
- K. Expansion Joints:
1. Conduits 3" and larger, that are secured to the building structure on opposite sides of a building expansion joint, require expansion and deflection couplings. Install couplings in accordance with the manufacturer's recommendations.
 2. Provide conduits smaller than 3" with junction boxes on both sides of the expansions joint. Connect conduits to junction boxes with sufficient slack of flexible conduit to produce 5" vertical drop midway between ends. Flexible conduit shall have a green copper ground-bonding jumper installed. In lieu of this flexible conduit, expansion and deflection couplings as specified above for three inches and larger conduits are also acceptable for conduits smaller than 3".
 3. Expansion fittings shall be provided for raceways to compensate for thermal expansion and contraction in conduit runs 200ft or greater and at building expansion joints. Bonding jumpers shall be provided for electrical continuity of the raceway system at the expansion fittings.
- L. Conductors: All conductors shall be installed in conduit. Conductors for building wiring shall have THHN/THWN, 600 volt insulation and shall be soft-drawn copper of standard American Wire Gauge (AWG) size. Minimum size shall be No. 12. 20 amp branch circuits more than 100 feet in length shall be upsized to No. 10. Provide individual neutral conductors for all single-pole branch circuits. Tied breaker handles are not acceptable. All wire No. 8 and larger shall be stranded. All branch circuits No. 10 and smaller shall be wired with color-coded wire with the same color used for a system throughout the building. Power feeders and branch circuits larger than No. 10 shall either be fully color coded or shall have black insulation and be similarly color coded with tape or paint in all junction boxes and panels. Where tape or paint is used to identify conductors, apply at all terminations, junction boxes, pull boxes and wireways. Apply tape, butt lapped, or paint for a minimum distance of 2" and, where applied to ends of conductors, start at cut end of the conductor insulation. Tape shall not cover manufacturers

conductors shall be color coded or labeled as necessary for clear identification. Color coding of all conductors shall be as follows:

Grounding	Bare or Green
208Y120 volt Three Phase (wye)	
Phase Conductors:	φA-Black, φB-Red, φC-Blue
Neutral:	White

2.6 JUNCTION AND PULL BOXES

- A. Junction and pull boxes shall meet requirements of National Electrical Code. Standard manufactured boxes shall be listed by Underwriters' Laboratories, Inc. Where custom designed and fabricated boxes are needed, they shall meet the construction standards of Underwriters' Laboratories, Inc. and the N.E.C.
- B. Junction and pull boxes shall be installed where required by National Electrical Code and where necessary to facilitate pulling of wire or cable. Considerations are sizes of wire and cable, number of bends in raceway, and conductor support requirements in vertical raceways. Maximum distance between terminations at junction or pull boxes, cabinets, or other points of termination shall not exceed 250 feet for straight horizontal runs. This length shall be decreased 50 feet for each 90° bend.
- C. Junction boxes for exposed work shall be FS or FD type. Boxes shall be threaded, cadmium-plated iron with weatherproof stainless steel cover and neoprene cover gaskets.

2.7 OUTLETS

- A. Outlet boxes shall be one piece or projection welded, galvanized stamped steel for gang sizes required. Where several devices are located on drawings in the same general location, use multi-gang boxes. Sectional boxes are not acceptable. Boxes shall be sized in accordance with National Electrical Code. Boxes required for communications systems, mechanical control devices, etc., shall be installed under this section of the specifications. Verify outlet box locations and sizes required for systems other than electrical power from shop and manufacturer's drawings, and install outlets as per those requirements.
- B. Boxes for wall and ceiling outlets shall finish flush and straight. Wall outlets in exposed concrete block, masonry, and tile walls shall be installed with extra deep square corner boxes or with standard boxes and square cornered tile wall covers so that conduit offsets are not required. Openings in concrete blocks or masonry walls shall be saw cut with an opening tolerance of 1/8" on all sides, the opening shall have bottom of box at nearest masonry joint to dimension indicated. For other wall finishes, boxes shall be installed with plaster or device type covers as required. No outlets shall be installed back-to-back. Where outlets occur in stud walls back to back on opposite sides, they shall be isolated by a stud between them.
- C. Floor Boxes (at grade) shall be four-compartment cast iron combination box equal to Wiremold Catalog No. RFB4-CI-1, complete with two CIHT-D internal duplex receptacle brackets and two CILT-2AB communication brackets. Provide brass-colored flanged activation kit (cover), UL listed for use on tile, terrazzo, carpet, and wood floors, equal to Wiremold Catalog No.

S36BBTCBS.

- D. Floor Boxes (above grade) shall be poke-through type, UL listed as suitable for use on tile and terazzo floor applications, equal to Wiremold RC3ATCAB, complete with a 20A prewired duplex receptacle.
- E. Multi-Outlet Assemblies (Horizontal Mounting) shall be electrically pre-wired steel raceways with receptacles mounted 24" on center, equal to Wiremold Catalog No. V4000HR1024, equipped with two-circuit power wiring, and ready to accommodate Pass & Seymour activation inserts.
- F. Multi-Outlet Assemblies (Vertical Mounting) shall be electrically pre-wired steel raceways with receptacles mounted 24" on center, equal to Wiremold Catalog No. V4000TD8, equipped with two-circuit power wiring, and ready to accommodate Pass & Seymour activation inserts.

2.8 WIRING DEVICES

- A. Colors: Wiring device and wall plate colors shall be selected by Architect for individual rooms from one of the following colors (unless another color is noted): Almond, black, brown, white, gray, ivory, light almond, or stainless steel.
- B. Receptacles: Duplex receptacles shall be specification grade, 20 amps, 125 volts with grounding terminal.
- C. Switches: Switches shall be specification grade, 20 amps, 120/277 volts A-C only, single pole, three-way or four-way as shown, single throw with screw terminals arranged for side wiring.
- D. Device Plates: Shall be of the constructed of polycarbonate.
- E. Ground Fault Receptacles: Furnish and install receptacles with ground fault circuit interrupters as indicated on plans. Receptacles shall be NEMA 5-20R configuration with 120V ac 20 amperes circuit rating. All receptacles shall be such depth as to permit mounting in outlet boxes 1 1/2" or greater in depth without the use of spacers. Units shall have line and load terminals such that connection to load terminals will provide ground fault protection for other receptacles. All receptacles shall accept standard duplex wall plates. All receptacles shall be noise suppressed and shall be UL listed.
- F. Isolated Ground (IG) Receptacles: Furnish and install specification grade type IG receptacles, orange in color. Plates for these devices shall also be stainless steel, compatible with the receptacle type.
- G. Automated Lighting Controls: Where indicated on the drawings, provide occupancy sensors, time switches, control relays and wiring for automatic control of lighting fixtures. Controls shall be as manufactured by Watt-Stopper, Crestron, Lutron, nLight, Sensorswitch, Philips, or Leviton.

2.9 LIGHTING FIXTURES

- A. Provide wired, cleaned, and with lamps specified, all fixtures designated on drawings. Contractor shall verify the ceiling construction for correct trim and support arrangement of

lighting fixtures; corrosion resistant plaster frames are required in plaster ceilings. Shop drawing submittals shall consist of properly identified copies of manufacturer's catalog pages showing all features and accessories specified.

- B. Secure mounting and support of all lighting fixtures shall be accomplished under this section of these specifications. Lighting fixtures shall be installed plumb, square, and level with the ceiling, wall, and in alignment with adjacent lighting fixtures. Mounting heights indicated shall be to the bottom of the fixture for ceiling-mounted fixtures and to center of fixture for wall-mounted fixtures. Lay-in troffer fixtures shall be supported with a minimum of 4 ceiling support wires per fixture and not more than 6 inches from each corner of the fixture. For fixtures smaller in size than the ceiling grid, provide a minimum of four wires per fixture. Do not support fixtures by ceiling acoustical panels. All concealed fixture mounting accessories shall be securely tied to structure. Flexible connections to fixtures shall not exceed 6 feet in length. Fixtures shall be solidly grounded to raceway system.
- C. In areas where the reflected ceiling plan is shown, all work shall be in conformance with this plan. If the ceiling grid is installed other than shown on the electrical plan, it shall be the responsibility of the installer of the lighting fixtures to call this fact immediately to the attention of the Architect and Contractor, and work shall not proceed until Architect's decision in the matter is obtained.
- D. LED drivers shall be highly efficient, class A noise rating, 0.9 or greater power factor, power supplies rated for the wattage requirements of the fixture. THD at full load shall be <10% at 120v and <20% at 277v. <3% line regulation, <1W stand-by power. LED power up time to be <1 sec. Load regulation <5%. Provide over voltage protection, non-latching output short circuit protection, current reduction LED load temperature protection. Ambient operating temperature range -30 degrees Celsius to 50 degrees Celsius at 85% non condensing relative humidity. Driver shall meet ANSI C62.41 Cat.A 2.5kv transient protection. Power supply shall be field programmable with 1mA resolution. Programmer shall not require the power supply to be powered up or connected to AC line voltage while programming. Provide integrated configurable LED thermal protection. Drivers shall be universal voltage input. Power supply shall be UL Class 2. LED dimming drivers shall provide continuous flicker-free dimming from 100%-1%.
- E. All lamps shall be the product of one manufacturer and shall be as manufactured by General Electric Osram/Sylvania, or Phillips. HPS lamps shall comply with the current published ANSI standards.

2.10 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protections: Take necessary precautions to protect all material, equipment, apparatus, and work from damage. Failure to do so to the satisfaction of the Architect will be sufficient cause for the rejection of the material, equipment, or work in question. Contractor is responsible for the safety and good condition of the materials installed until final acceptance by the Owner.
- B. Cleaning: Conduit openings shall be capped or plugged during installation. Fixtures and equipment shall be tightly covered and protected against dirt, moisture, chemical, and mechanical injury. At the completion of the work, the fixtures, material and equipment shall be thoroughly cleaned and delivered in condition satisfactory to the Architect.

PART 3 - EXECUTION

3.1 EXCAVATION, TRENCHING AND BACKFILLING

- A. Trenches for all underground conduits shall be excavated to the required depth. The bottom of trenches shall be tamped hard. Before backfilling the excavation shall be cleaned of trash and debris. Backfill shall consist of excavation or borrow of sand, gravel, or other approved material free of trash, lumber, sawdust or other debris. Backfill shall be placed in 9" thick moistured and hand or machine tamped layers. Backfill shall be brought to suitable elevation above ground to provide for anticipated settlement and shrinkage. All paving broken up shall be repaired and returned to the original condition.

3.2 PAINTING

- A. Contractor shall touch-up or refinish all items of electrical equipment furnished with a factory finish coat of paint and which may have been damaged regardless of cause.

3.3 TESTING AND BALANCING

- A. Balance all single phase loads connected to all panelboards to ensure an approximate equal division on these loads on main power supply serving building. All tests shall be made in accordance with the latest standards of the IEEE and the NEC. The installation shall be tested for performance, grounds and insulation resistance. "Megger" type instruments shall be used. Contractor shall perform circuit continuity and operational tests on all equipment furnished or connected by Contractor. The tests shall be made prior to final inspection. The Contractor shall provide all testing equipment and all costs shall be borne by him. Written reports shall be made of all tests. These reports shall be turned over to the Architect at time of final inspection. All faults shall be corrected immediately.

3.4 CLEANING UP

- A. The Contractor shall remove all oil, grease, or other stains resulting from his work performed in the building or the exterior thereof.

END OF SECTION 16100

SECTION 16720 - FIRE DETECTION AND ALARM SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.
- B. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.
- C. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).
- D. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

1.2 SCOPE

- A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.
- B. Basic Performance:
 - 1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
 - 2. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.
 - 3. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.
 - 4. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
 - 5. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.
 - 6. All circuits shall be power-limited, per UL864 requirements.

C. BASIC SYSTEM FUNCTIONAL OPERATION

When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

- 1. The system alarm LED on the system display shall flash.
- 2. A local piezo electric signal in the control panel shall sound.

3. A backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
4. Printing and history storage equipment shall log the information associated with each new fire alarm control panel condition, along with time and date of occurrence.
5. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.

1.3 SUBMITTALS

A. General:

1. Copies of all submittals shall be submitted to the Architect/Engineer for review. Coordinate quantity with Architect.

B. Shop Drawings:

1. Shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire alarm system design.
 - b. Fire alarm certified by NICET, minimum Level III.
2. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
3. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, conduit layouts, and riser diagram.
4. Show annunciator layout, configurations, and terminations.
5. Battery size calculation, NAC circuit cable voltage drop calculation.

C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

D. Software Modifications

1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

E. Certifications: Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the

proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.4 GUARANTY

- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.5 POST CONTRACT MAINTENANCE

- A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.
- B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.
- C. Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The schedule shall include:
 - 1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.
 - 2. Each circuit in the fire alarm system shall be tested semiannually.

1.6 APPLICABLE STANDARDS AND SPECIFICATIONS:

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

- A. National Fire Protection Association (NFPA) - USA:

No. 13	Sprinkler Systems
No. 15	Water Spray Systems
No. 16	Foam/Water Deluge and Spray Systems
No. 70	National Electric Code
No. 72	National Fire Alarm Code
No. 101	Life Safety Code

- B. Underwriters Laboratories Inc. (UL) - USA:

No. 268	Smoke Detectors for Fire Protective Signaling Systems
No. 864	Control Units for Fire Protective Signaling Systems

- No. 268A Smoke Detectors for Duct Applications
- No. 521 Heat Detectors for Fire Protective Signaling Systems
- No. 464 Audible Signaling Appliances
- No. 38 Manually Actuated Signaling Boxes
- No. 50 Cabinets and Boxes
- No. 346 Waterflow Indicators for Fire Protective Signaling Systems
- No. 1076 Control Units for Burglar Alarm Proprietary Protective Signaling Systems
- No. 1971 Visual Notification Appliances

- C. Local and State Building Codes.
- D. All requirements of the Authority Having Jurisdiction (AHJ)

1.7 APPROVALS

- A. The system shall have proper listing and/or approval from the following nationally recognized agencies:
 - 1. UL Underwriters Laboratories Inc
- B. The fire alarm control panel shall meet UL Standard 864 Ninth Edition (Control Units).

PART 2- PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. FACP and Equipment:
 - a. Edwards Systems Technology
 - b. Notifier; by Honeywell
 - c. Siemens Building Technologies
 - d. Gamewell Fire Control Instruments
 - e. Fike Corporation
 - f. SimplexGrinnell
 - 2. Wire and Cable:
 - a. Comtran Corporation
 - b. Helix/HiTemp Cables, inc.; by Draka USA
 - c. Rockbestos-Suprenant Cable Corporation; by Marmon Group Company
 - d. West Penn Wire/CDT; by Cable Design Technologies

2.2 EQUIPMENT AND MATERIAL, GENERAL

- A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the

National Fire Alarm Code.

- B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
- C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.3 CONDUIT AND WIRE

A. Conduit:

1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
2. All wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-55.
4. Wiring for 24 volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
6. Conduit shall be 3/4-inch (19.1 mm) minimum.

B. Wire:

1. All fire alarm system wiring shall be new.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 16 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wiring used for the multiplex communication circuit (SLC) shall be twisted and unshielded and support a minimum wiring distance of 12,500 feet. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit.
5. All field wiring shall be electrically supervised for open circuit and ground fault.
6. The fire alarm control panel shall be capable of t-tapping Class B (NFPA Style 4) Signaling Line Circuits (SLCs). Systems that do not allow or have restrictions in, for example, the amount of t-taps, length of t-taps etc., are not acceptable.

- C. Terminal Boxes, Junction Boxes and Cabinets: All boxes and cabinets shall be UL listed for their use and purpose.
- D. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.
- E. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

2.4 MAIN FIRE ALARM CONTROL PANEL OR NETWORK NODE

- A. Main FACP or network node shall contain a microprocessor based Central Processing Unit (CPU) and power supply. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.
- B. Operator Control
 - 1. Acknowledge Switch:
 - a. Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the LCD display to the next alarm or trouble condition.
 - b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.
 - 2. Alarm Silence Switch: Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.
 - 3. Alarm Activate (Drill) Switch: The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
 - 4. System Reset Switch: Activation of the System Reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
 - 5. Lamp Test: The Lamp Test switch shall activate all local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personal.
- C. System Capacity and General Operation
 - 1. The control panel or each network node shall include Form-C alarm, trouble, and supervisory relays rated at a minimum of 2.0 amps @ 30 VDC.
 - 2. It shall include Class B (NFPA Style Y) or Class A (NFPA Style Z) programmable Notification Appliance Circuits.
 - 3. The Notification Appliance Circuits shall be programmable to Synchronize with System Sensor, and Notification Appliances.
 - 4. The system shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color coded system

- status LEDs, and an alphanumeric keypad with easy touch keys for the field programming and control of the fire alarm system.
5. The system shall be programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers.
 6. The system shall allow the programming of any input to activate any output or group of outputs
 7. The FACP or each network node shall provide the following features:
 - a. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
 - b. Detector sensitivity test, meeting requirements of NFPA 72, Chapter 7.
 - c. Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
 - d. Multiple sensitivity levels for alarm, selected by detector. The system shall also support sensitive advanced detection laser detectors. The system shall also include multiple levels of Prealarm, selected by detector, to indicate impending alarms to maintenance personnel.
 - e. The ability to display or print system reports.
 - f. Alarm verification, with counters and a trouble indication to alert maintenance personnel.
 - g. PAS presignal, meeting NFPA 72 3-8.3 requirements.
 - h. Devices shall meet NFPA 72 Chapter 1 requirements for activation of notification circuits within 10 seconds of initiating device activation.
 - i. Periodic detector test, conducted automatically by the software.
 - j. Self optimizing pre-alarm for advanced fire warning, which allows each detector to learn its particular environment and set its prealarm level to just above normal peaks.
 - k. Cross zoning with the capability of counting: two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
 - l. Walk test, with a check for two detectors set to same address.
 - m. Day/night automatic adjustment of detector sensitivity.
 8. The FACP shall be capable of coding main panel node notification circuits in March Time (120 PPM), and Temporal (NFPA 72 A-2-2.2.2). Panel notification circuits (NAC 1,2,3 and 4) shall also support Two-Stage operation. Two stage operation shall allow 20 Pulses Per Minute (PPM) on alarm and 120 PPM after 5 minutes or when a second device activates.
 9. Network Communication
 - a. The FACP shall be capable of communicating on a Local Area Network (LAN), a firmware package that utilizes a peer-to-peer, inherently regenerative communication format and protocol.

D. Central Microprocessor

1. The microprocessor shall be a state-of-the-art, high speed device and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, Flash memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.
2. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.
3. The microprocessor shall also provide a real-time clock for time annotation of system

displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.

4. A special program check function shall be provided to detect common operator errors.
5. An auto-program (self-learn) function shall be provided to quickly install initial functions and make the system operational.
6. For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download, and have the ability to upgrade the manufacturers (FLASH) system code changes. This program shall also have a verification utility, which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete testing of any system operating changes. This shall be in compliance with the NFPA 72 requirements for testing after system modification.

E. System Display

1. The system shall support the following display mode options:
 - a. 80 character display option. The display shall include an 80-character backlit alphanumeric Liquid Crystal Display (LCD) and a full PC style QWERTY keypad.
2. The display shall provide all the controls and indicators used by the system operator:
 - a. The 80-character display shall include the following operator control switches: ACKNOWLEDGE, ALARM SILENCE, ALARM ACTIVATE (drill), SYSTEM RESET, and LAMP TEST.
3. The display shall annunciate status information and custom alphanumeric labels for all intelligent detectors, addressable modules, internal panel circuits, and software zones.
4. The display shall also provide Light-Emitting Diodes.
 - a. The 80-character display shall provide 12 Light-Emitting-Diodes (LEDs), that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM WARNING, SUPERVISORY SIGNAL, SYSTEM TROUBLE, DISABLED POINTS, ALARM SILENCED, Controls Active, Pre-Discharge, Discharge and Abort.
5. The display shall have QWERTY type keypad.
 - a. The 80-character display keypad shall be an easy to use QWERTY type keypad, similar to a PC keyboard. This shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
6. The system shall support the display of battery charging current and voltage on the 80-character LCD display.

F. Signaling Line Circuits (SLC)

1. Each SLC interface shall provide power to and communicate with intelligent detectors (ionization, photoelectric or thermal) and intelligent modules (monitor or control).
2. CPU shall receive information from all intelligent detectors to be processed to determine whether normal, alarm, prealarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. Information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

G. Serial Interfaces: The system shall include a minimum of two interfaces as a means of connecting UL Listed Information Technology Equipment (ITE) peripherals.

H. Enclosures:

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. The back box and door shall be constructed of steel with provisions for electrical conduit connections into the sides and top.
3. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be site configured for either right or left hand hinging.

I. Power Supply:

1. A high tech off-line switching power supply shall be available for the fire alarm control panel or network node and provide power for the control panel and peripheral devices.
2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
3. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger or may be used with an external battery and charger system. Battery arrangement may be configured in the field.
4. The power supply shall continuously monitor all field wires for earth ground conditions, and shall have the following LED indicators:
Ground Fault LED
AC Power Fail LED
NAC on LED (4)
5. The main power supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.
6. The main power supply shall provide a battery charger using dual-rate charging techniques for fast battery recharge.
7. All circuits shall be power-limited, per UL864 requirements.

J. Specific System Operations

1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window.
2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
3. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.
4. Point Read: The system shall be able to display or print the following point status diagnostic functions:
 - a. Device status
 - b. Device type
 - c. Custom device label
 - d. View analog detector values
 - e. Device zone assignments
 - f. All program parameters
5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.

6. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing events. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety. The history buffer shall use non-volatile memory.
7. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
8. The fire alarm control panel shall include a walk test feature. It shall include the ability to test initiating device circuits and notification appliance circuits from the field without returning to the panel to reset the system. Operation shall be as follows:
 - a. Alarming an initiating device shall activate programmed outputs, which are selected to participate in walk test.
 - b. Introducing a trouble into the initiating device shall activate the programmed outputs.
 - c. All devices tested in walk test shall be recorded in the history buffer.
9. Waterflow Operation - An alarm from a waterflow detection device shall activate the appropriate alarm message on the main panel display, turn on all programmed notification appliance circuits and shall not be affected by the signal silence switch.
10. Supervisory Operation - An alarm from a supervisory device shall cause the appropriate indication on the system display, light a common supervisory LED, but will not cause the system to enter the trouble mode.
11. Signal Silence Operation - The FACP shall have the ability to program each output circuit (notification, relay, speaker etc) to deactivate upon depression of the signal silence switch.
12. Non-Alarm Input Operation - Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.
13. Combo Zone - A special type code shall be available to allow waterflow and supervisory devices to share a common addressable module. Waterflow devices shall be wired in parallel, supervisory devices in series.

2.5 SYSTEM COMPONENTS

- A. Strobe lights shall meet the requirements of the ADA, UL Standard 1971, be fully synchronized, and shall meet the following criteria:
 1. The maximum pulse duration shall be 2/10 of one second
 2. Strobe intensity shall meet the requirements of UL 1971.
 3. The flash rate shall meet the requirements of UL 1971.
- B. Horn/Strobes:
 1. Wall mounted flush or semi-flush
 2. Operate on 24 VDC
 3. Output of 90dB minimum at 10 feet.
 4. Have two selectable tone options of temporal 3 and non-temporal continuous pattern.
 5. Have at least 2 audibility options

6. Maximum Pulse Duration: 0.2 second.
7. Strobe Intensity: UL 1971.
8. Flash Rate: UL 1971.
9. Outdoor products listed to UL 1638 (strobe) and UL 464 (horn) outdoor requirements. Rainproof per UL 50.
10. Strobe Candela Rating: Determine by positioning selector switch on back of device.
11. Outdoor horn shall be listed for outdoor use by UL and shall operate between minus 40 degrees and 151 degrees Fahrenheit. The products shall be listed for use with a outdoor/weatherproof back box with half inch and three-fourths inch conduit entries.

C. Waterflow Indicator:

1. Waterflow Switches shall be an integral, mechanical, non-coded, non-accumulative retard type.
2. Waterflow Switches shall have an alarm transmission delay time which is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds.
3. All waterflow switches shall come from a single manufacturer and series.
4. Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.
5. Where possible, locate waterflow switches a minimum of one (1) foot from a fitting which changes the direction of the flow and a minimum of three (3) feet from a valve.

D. Sprinkler and Standpipe Valve Supervisory Switches:

1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
2. PIV (post indicator valve) or main gate valves shall be equipped with a supervisory switch.
3. The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
4. The supervisory switch shall be contained in a weatherproof aluminum housing, which shall provide a 3/4 inch (19 mm) conduit entrance and incorporate the necessary facilities for attachment to the valves.
5. The switch housing shall be finished in red baked enamel.
6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.
 - a. This unit shall provide for each zone: alarm indications, using a red alarm and yellow trouble long-life LEDs and control switches for the control of fire alarm control panel functions. The annunciator will also have an ON-LINE LED, local piezo electric signal, local acknowledge/lamp test switch, and custom slide-in zone/function identification labels.
 - b. Switches shall be available for remote annunciation and control of output points in the system, system acknowledge, telephone zone select, speaker select, global signal silence, and global system reset within the confines of all applicable standards.

E. Alphanumeric LCD Type Annunciator:

1. The alphanumeric display annunciator shall be a supervised, remotely located back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.
 2. The LCD annunciator shall display all alarm and trouble conditions in the system.
 3. An audible indication of alarm shall be integral to the alphanumeric display.
 4. The display shall be UL listed for fire alarm application.
 5. It shall be possible to connect up to 32 LCD displays and be capable of wiring distances up to 6,000 feet from the control panel.
 6. The annunciator shall connect to a separate, dedicated "terminal mode" EIA-485 interface. This is a two-wire loop connection and shall be capable of distances to 6,000 feet. Each terminal mode LCD display shall mimic the main control panel.
 7. The system shall allow a minimum of 32 terminal mode LCD annunciators. Up to 10 LCD annunciators shall be capable of the following system functions: Acknowledge, Signal Silence and Reset, which shall be protected from unauthorized use by a keyswitch or password.
 8. The LED annunciator shall offer an interface to a graphic style annunciator and provide each of the features listed above.
- G. Field Wiring Terminal Blocks - For ease of service all panel I/O wiring terminal blocks shall be removable, plug-in types and have sufficient capacity for #18 to #12 AWG wire.

2.6 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

A. Addressable Devices – General

1. Addressable devices shall use simple to install and maintain decade, decimal address switches.
2. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.
3. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
4. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.
5. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
6. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Bases shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications.
7. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
8. Detectors shall also store an internal identifying type code that the control panel shall

use to identify the type of device (ION, PHOTO, THERMAL).

9. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
 10. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.
 11. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.
 12. Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.
- B. Addressable Manual Fire Alarm Box (manual station)
1. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
 2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
 3. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.
- C. Intelligent Photoelectric Smoke Detector - The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
- D. Intelligent Thermal Detectors - Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.
- E. Intelligent Duct Smoke Detector
1. The smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
 2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.
- F. Addressable Dry Contact Monitor Module
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.
 2. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational

and in regular communication with the control panel.

3. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.

G. Two Wire Detector Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
2. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

H. Addressable Control Module

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances.
2. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation.
3. Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised UL listed remote power supply.
4. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

- I. Addressable Relay Module - Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

J. Isolator Module

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.
2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
3. The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

K. Door Holders

1. Door Holders will be available in 120VAC and 24VDC models.
2. 120VAC models will be transient-protected against surges up to 600 volts.

3. Door holders will be designed for Fail Safe operation (power failure release door to close).

L. Elevator Recall

1. Smoke detectors will be installed in the elevator hoist shaft. An alarm from such devices will signal the elevator to initiate emergency procedures. All lift call buttons, door buttons and signals will become inoperative in the lift bank serving the machine room. Lifts will immediately be sent to the main floor of egress (ground level) where they will be decommissioned until the alarm condition has been cleared or manually taken over by Fire Department Personnel.
2. Smoke detectors will be installed in each elevator lobby. These detectors will function to signal the elevator to recall to the primary floor of egress (ground level) in the event of an alarm. Detectors on the first floor will signal the elevator to recall to the secondary floor of egress.

2.7 BATTERIES

- A. The battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
- B. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.
- C. If necessary to meet standby requirements, external battery and charger systems may be used.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2 TEST

The service of a competent, factory-trained engineer or technician authorized by the

manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

- A. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
- B. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
- C. Verify activation of all waterflow switches.
- D. Open initiating device circuits and verify that the trouble signal actuates.
- E. Open and short signaling line circuits and verify that the trouble signal actuates.
- F. Open and short notification appliance circuits and verify that trouble signal actuates.
- G. Ground all circuits and verify response of trouble signals.
- H. Check presence and audibility of tone at all alarm notification devices.
- I. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
- J. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
- K. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL INSPECTION

- A. At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

3.4 INSTRUCTION

- A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION

SECTION 27 00 00 - COMMUNICATIONS STRUCTURED CABLING SYSTEM**PART 1 – GENERAL****1.1 CONTRACTOR QUALIFICATIONS**

The Structured Cabling System Contractor shall be an experienced firm regularly engaged in the layout and installation of structured cabling systems of similar size and complexity as required for this installation. The Structured Cabling System Contractor, under the same company name, shall have successfully completed the layout, installation, testing and warranty of not less than five Structured Cabling Systems of the scope of the largest system on this project for a minimum period of three years prior to the bid date, and shall have been regularly engaged in the business of Structured Cabling Systems contracting continuously since. The Structured Cabling System Contractor shall have an existing permanent office located within 100 miles of the job site from which installation and warranty service operations will be performed.

The Structured Cabling System Contractor shall be in good standing with the Structured Cabling System Manufacturer (Panduit) as a Certified Installer. The Structured Cabling System Contractor shall complete the Structured Cabling System Manufacturer's Certified Installer training program. The Structured Cabling System Manufacturer shall require that not less than two permanent employees of the Structured Cabling System Contractor each complete the full certification program. Each Certified Installer shall attend re-certification classes every two years. The Structured Cabling System certified employees shall include not less than one designer and one installation supervisor. The Structured Cabling System Contractor shall present, with his bid, the names and credentials of the Factory certified installers who will be responsible for this project.

In addition, the Structured Cabling System Contractor shall present, with his bid, the name and certification number of a BICSI certified Registered Communications Distribution Designer (RCDD) who is a permanent employee of the Structured Cabling System Contractor. The Structured Cabling System Contractor shall maintain this RCDD, or another RCDD approved by the Architect/Engineer, in his permanent employment throughout this project. The RCDD shall have overall responsibility for certifying that the installed structured cabling system conforms to these contract documents and to the referenced EIA/TIA, IEEE, BICSI, and UL standards. Specific requirements for the RCDD are as follows:

- 1.1.1 The RCDD shall be, in the judgment of the Architect/Engineer, thoroughly experienced in the design, layout, and installation of structured cabling systems of similar size and complexity as required for this installation. The RCDD shall submit evidence of these qualifications to the Architect/Engineer upon request.
- 1.1.2 The RCDD shall affix his stamp to the Contractor's pre-installation submittal drawings, indicating that he has reviewed and approved the drawings for conformance to the contract documents and to the referenced codes and standards.
- 1.1.3 The RCDD shall periodically visit the site and inspect the work in progress. RCDD site visits shall be made not less than once per month when the job is in active progress. The RCDD shall prepare a field report for each site visit for submission to the Architect/Engineer.
- 1.1.4 The RCDD shall sign off on all copper and fiber optic cable test results, indicating that he was in responsible charge of all cable testing procedures and that all cables were tested in compliance with the contract documents and met or exceeded the requirements stated therein.
- 1.1.5 The RCDD shall affix his stamp to the Contractor's as-built drawings, indicating that he has

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reviewed and approved the drawings as being complete, accurate, and representative of the system as actually installed.

- 1.1.6 The RCDD shall be present for and participate in not less than four hours of user training.

- 1.1.7 Contractor Qualifications – Television System Installation:

The Structured Cabling System Contractor shall assign a lead technician to oversee the installation of the Television (TV) System for this project. The TV System lead technician shall be thoroughly skilled and experienced in the installation and configuration of the TV components required for the project. The TV System lead technician shall attend the pre-construction conference, construction progress meetings as required, and all close-out and training meetings.

The TV System lead technician shall periodically visit the site and inspect the work in progress. Lead technician site visits shall be made not less than once per month when the job is in active progress. The TV System lead technician shall prepare a field report for each site visit for submission to the Engineer.

The TV System lead technician shall sign off on all cable and system test results.

The TV System lead technician shall be present for and participate in not less than four hours of user training.

- 1.1.8 Contractor Qualifications – Conduit Installation:

All conduit and related work shall be provided by a licensed electrical contractor using tradesmen who are skilled and experienced in the types of conduit installations indicated in the bid documents.

- 1.1.9 Definitions

CM - Construction Manager
DB - Design Build Contractor
GC - General Contractor

Where the three terms CM, DB, and GC are used in the specifications and TEL drawings they are used interchangeably. The Contractor shall understand the terms to mean the construction entity in overall charge of the project, whether a CM, DB or GC.

- 1.2 PROOF OF CONTRACTOR QUALIFICATIONS

The Structured Cabling System Contractor shall provide the following documentation, to be presented with his bid, as evidence that the requirements for Structured Cabling System Contractor qualifications listed above are satisfied. All work under this section shall be performed by permanent employees of the Structured Cabling System Contractor listed on the bid form, and shall not be performed by another subcontractor, employees of another company, or by temporary employees. The only exception to this requirement shall be for conduit work, which shall be performed by an electrical contractor meeting the minimum requirements of paragraph 1.1.8.

- 1.2.1 Provide a list of not less than five (5) references for jobs of similar size and complexity including project name, location, contact person and phone number.

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- 1.2.2 Provide RCDD name, BICSI certification number, and qualifications.
- 1.2.3 Provide location of existing permanent office from which installation and warranty work will be performed.
- 1.2.4 Provide copies of certificates issued by Structured Cabling System Manufacturer proving that the Structured Cabling System Contractor is in good standing with the manufacturer as a Certified Installer, and that the Structured Cabling System Contractor can offer the Owner a 20 year system warranty in partnership with the Structured Cabling System Manufacturer.

1.3 RELATED REQUIREMENTS

Drawings and general provisions of Contract apply to this section.

Electrical Specification Sections regarding conduit and raceway apply to work under this section, with the additions and modifications specified herein and on the communications drawings. The special requirements indicated on the communications drawings and in this specification section for structured cabling system conduit and all cable pathways shall take precedence over any requirements specified in Electrical Specification Sections.

1.4 DESCRIPTION OF WORK

The work consists of all labor, materials, equipment and services necessary to provide, install, test and certify all systems as described in the contract documents. The Structured Cabling System Contractor shall provide systems complete and ready for operation. The installation shall include all accessories and appurtenances required to provide a complete and operational system. Any materials not specifically mentioned in these specifications or not shown on the drawings, but required for a complete and finished installation shall be furnished and installed at no additional cost to the Owner.

1.4.1 Scheduling:

The Structured Cabling System Contractor shall become thoroughly familiar with the overall project schedule, and shall complete his work and make all systems fully operational prior to the date of occupancy of the facilities by the Owner.

The Structured Cabling System Contractor shall coordinate all work with the General Contractor and the Electrical Contractor, as well as all other trades.

The Structured Cabling System Contractor shall be responsible for coordinating all work related to cable pathways indicated on the communications drawings, even if that work is being performed by the project electrical contractor. The Structured Cabling System Contractor shall inform the General Contractor if:

- 1) The conduit work is not being completed in accordance with the requirements indicated on the communications drawings and this specification.
- 2) The conduit work is not being completed in such a manner that will allow the Structured Cabling System Contractor to complete his work in a timely manner in accordance with the project schedule and this section

The Structured Cabling System Contractor shall provide adequate training of the Owner's forces prior to the date of occupancy, and shall provide follow-up training after occupancy. Total training time shall be as prescribed by this specification is considered a minimum requirement.

1.5 EXAMINATION OF SITES AND TOTAL SYSTEM RESPONSIBILITY

Prior to providing a proposal for this work, the Contractor shall visit the proposed site of work to become familiar with any condition that may affect the work to be performed in any way. No allowances shall be made because of lack of knowledge of these conditions.

The Contractor shall have total system responsibility to assure a fully operational system. Any additional labor and components required for the installation of complete operating systems but not specifically required by the bid documents shall be provided and the cost borne by the Contractor.

The Contractor shall remain the sole owner of the system and all of its components provided under this contract and is responsible for all risk of loss or damage of the system for the entire contract period up to and including the date and time of Final Acceptance by the Architect/Engineer and the Owner's Project Manager. After the date of Final Acceptance, the Owner shall assume full ownership of the system with all components, and the warranty period shall commence.

1.6 QUALITY ASSURANCE

Materials shall be new and shall be the best of their respective kinds. All work shall be accomplished in a workmanlike manner in keeping with the best practices and highest standards of the telecommunications industry.

Protect materials and equipment from physical or environmental damage during shipping, storage and installation. Equipment and materials shall be received at the site in new condition and shall be maintained in new condition throughout the installation process. Damaged or deteriorated equipment and materials will not be acceptable. The Contractor shall be responsible for the safety and condition of all materials and equipment, whether stored or installed, until Final Acceptance by the Architect/Engineer and the Owner.

1.7 CODES AND STANDARDS

All work done under this contract shall be performed in accordance with the most recent issue of the following codes, standards and guidelines. Where there is a perceived conflict between a standard or guideline and the contract documents, the Contractor shall perform the work as directed by the Architect/Engineer.

NFPA 70	National Electric Code - 2014 Edition
NFPA 90A	Standard for the installation of Air-Conditioning and Ventilating Systems – current edition
NFPA 101	Life Safety Code - current Edition
FBC	Florida Building Code – 2017 Sixth Edition Florida Fire Prevention Code - Sixth Edition Florida Building Code Accessibility – 2014 Sixth Edition
TIA	Telecommunications Industry Association, current edition of each standard at the time of bids applies (regardless of edition indicated below)

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TIA-568.0-D	Generic Telecommunications Cabling for Customer Premises
TIA-568.1-D	Commercial Building Telecommunications Infrastructure Standard
TIA 568.2-D	Balanced Twisted-Pair Telecommunications Cabling and Components Standard
TIA 568.3-D	Optical Fiber Cabling and Components Standard
TIA 568.4-D	Broadband Coaxial Cabling and Components Standard
TIA 569-D	Telecommunications Pathways and Spaces
TIA 598-B	Optical Fiber Cable Color Coding
TIA-526	Standard Test Procedures for Fiber Optic Systems (Singlemode Fiber Optical Power Loss measurement TIA-526-7 Revision A 2015 and Multimode Fiber Optical Power Loss measurement TIA-526-14 Revision C 2015).
TIA 606-C	Administration Standard for Commercial Telecommunications Infrastructure
TIA-607-C	Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
TIA-758-B	Customer-Owned Outside Plant Telecommunications Infrastructure Standard
TIA-862-B	Structured Cabling Infrastructure Standard for Intelligent Building Systems
IEEE	Institute of Electrical and Electronics Engineers
	IEEE 802-2001, IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture
IEEE	LAN/MAN Bridging & Management (802.1)
	IEEE 802.1f-1993, IEEE Standard for Local and Metropolitan Area Networks: Common Definitions and Procedures for IEEE 802 Management Information
	IEEE 802.1h, 1997 Edition (R2001) (ISO/IEC TR11802-5: 1997), IEEE Technical Report and Guidelines--Part 5: Media Access Control (MAC) Bridging of Ethernet V2.0 in Local Area Networks
	IEEE 802.1b, 1995 Edition (ISO/IEC 15802-2-1995), IEEE Standard for Information technology--Telecommunications and information exchange between systems--IEEE standard for local and metropolitan area networks--Common specifications--Part 2: LAN/MAN Management
	IEEE 802.1d, 1998 Edition (ISO/IEC 15802-3:1998, IEEE Standard for Information technology--Telecommunications and information exchange

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between systems--IEEE standard for local and metropolitan area networks--Common specifications--Media access control (MAC) Bridges

IEEE 802.1t-2001, Amendment to IEEE Std 802.1D, 1998 Edition IEEE Standard for Information technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Common specifications--Part 3: Media Access Control (MAC) Bridges: Technical and Editorial Corrections

IEEE 802.1w-2001, IEEE Standard for Information technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Common specifications Part 3: Media Access Control (MAC) Bridges--Amendment 2--Rapid Reconfiguration

[Amendment to IEEE Std 802.1D, 1998 Edition (ISO/IEC 15802-3:1998) and IEEE Std 802.1t-2001]

IEEE 802.1e, 1994 Edition, IEEE Standard for Information technology--Telecommunications and information exchange between systems--IEEE standard for local and metropolitan area networks--Common specifications--Part 4: System Load Protocol

IEEE 802.1g, 1998 Edition, Information technology--Telecommunications and information exchange between systems--IEEE standard for local and metropolitan area networks--Common specifications--Part 5: Remote Media Access Control (MAC) bridging

IEEE 802.1q-1998, IEEE standard for local and metropolitan area networks: Virtual Bridged Local Area Networks

P802.1s/D13, Draft IEEE Standard for Local and Metropolitan Area Networks--Amendment 3 to IEEE 802.1q Virtual Bridged Local Area Networks: Multiple Spanning Trees

IEEE 802.1u-2001, (Amendment to IEEE Std 802.1q, 1998 Edition) IEEE Standard for Local and metropolitan area networks--Virtual Bridged Local Area Networks--Amendment 1: Technical and editorial corrections

IEEE 802.1v-2001, (Amendment to IEEE Std 802.1q, 1998 Edition) IEEE Standards Amendment to IEEE 802.1q: IEEE Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks--Amendment 2: VLAN Classification by Protocol and Port

IEEE 802.1x2001 IEEE Standards for Local and Metropolitan Area Networks: Port-Based Network Access Control

IEEE CSMA/CD Access Method (802.3)

IEEE 802.3-2002® IEEE Standard for Information technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements -Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications. Incorporates the IEEE 802.3z Standard for 1000BASE-X Gigabit Ethernet over fiber optic cabling and

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the IEEE 802.3ab Standard for 1000BASE-T Gigabit Ethernet over copper UTP cabling.

IEEE 802.3ae-2002 (standard ratified June 2002)
Supplement to IEEE 802.3 CSMA/CD Access Method & Physical Layer Specifications - Media Access Control (MAC) Parameters, Physical Layer, and Management Parameters for 10Gb/s Operation

IEEE 802.3at Amendment: Data Terminal Equipment (DTE) Power Via the Media Dependent Interface (MDI) Enhancements (PoE Plus)

IEEE Wireless LANs (802.11)

IEEE Std 802.11, 1999 Edition, IEEE Standard for Information

Technology - Telecommunications and Information Exchange between Systems - Local and Metropolitan Area Network - Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications

IEEE 802.11a-1999, Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications—Amendment 1: High-speed Physical Layer in the 5 GHz band (An errata is available)

IEEE 802.11b-1999 Supplement to 802.11-1999, Wireless LAN MAC and PHY specifications: Higher speed Physical Layer (PHY) extension in the 2.4 GHz band

IEEE 802.11d-2001, Amendment to IEEE 802.11-1999, (ISO/IEC 8802-11) Information technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements--Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Specification for Operation in Additional Regulatory Domains

IEEE 802.11n-2009, Amendment 5 to IEEE 802.11-1999, Enhancements for Higher Throughput

IEEE 802.11ac, Enhancements for very high throughput WLANs

BICSI

Building Industry Consulting Service International

Telecommunications Distribution Methods Manual (TDMM) Latest Edition

Network Design Reference Manual (NDRM) Latest Edition

Outside Plant Design Reference Manual (OSPDRM) – Latest Edition

Telecommunications Cabling Installation Manual (TCIM) Latest Edition

AT&T

"Outside Plant Engineering Handbook"

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SCTE

Society of Cable Television Engineers

All materials and equipment shall be UL listed for the intended application.

1.8 PRE-INSTALLATION SUBMITTALS

1.8.1 Manufacturer's Catalog Data:

Submit five (5) copies of manufacturer's standard descriptive data sheets to the Architect/Engineer for review and approval prior to commencing work. Furnish complete data sheets bearing the printed logo or trademark of the manufacturer for each type of product being provided. Mark each copy of the data sheets for the specific product being provided with an identifying mark, arrow, or highlighting. The following items shall be submitted:

1. Conduit and Pull Boxes, Fittings, Related Hardware & Accessories, each type
2. Cable Runway, Fittings, Related Hardware & Accessories, each type
3. Racks, Related Hardware & Accessories, each type
4. Enclosures and Cabinets, each type
5. Copper Patch Panels, each type
6. Copper Wiring/Patch Blocks, each type
7. Multi-pair Voice Cable, each type
8. Voice Protector Blocks, each type
9. Voice Surge Protectors, 66 block mounted, each type
10. Category 6 UTP Cable, each type
11. Cable End Connectors, each type
12. Patch Cables - Copper and Fiber Optic, each type
13. Patch Cord Organizers and Cable Rings, each type
14. Wire Management Devices, each type
15. Communications Outlets (CO), each type
16. Special Purpose Outlets, each type
17. RG11 Coaxial Cable, each type
18. RG6 Coaxial Cable, each type
19. TV Splitters, Taps, Attenuators and Equalizers, each type
20. TV Outlets and Device Plates
21. Coaxial Cable Connectors, each type
22. TV Jumpers
23. TV Amplifiers, each type
24. TV Surge Suppressors, each type
25. Power Surge Protectors
26. Uninterruptible Power Supplies (UPS), each type
27. Grounding Busbars and Lugs, each type
28. Firestopping Systems, each type
29. Labeling Products, each type
30. All other materials and equipment indicated to be furnished under this section, whether specifically listed here or not.

1.8.2 Pre-Installation Drawings:

As part of the Structured Cabling System installation, the Contractor shall provide detailed documentation to facilitate system administration, maintenance, and future moves, adds and changes. Drawings shall be provided which incorporate all information in the Contract Drawings, and which fully document any and all Architect/Engineer approved changes in materials and methods made by the Contractor. Drawings are not required if no changes to the design are made by the Contractor. Changes to the design shall not be made without the prior written approval of the Architect/Engineer. Drawings shall provide the same level of detail as the bid

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documents. *Electronic files of the Architect/Engineer's AutoCAD drawings will not be provided to the Contractor.*

Drawings shall be prepared using AutoCAD Release 14 and shall be furnished in hard-copy format and on industry standard CD or ZIP drive media.

Submit five (5) copies of pre-installation drawings to the Architect/Engineer for review and approval prior to commencing work.

1.9 CONTRACTOR'S RECORD DOCUMENTS

The Structured Cabling System Contractor shall maintain a full set of contract documents at the job site at all times, consisting of specifications, drawings, addenda, pre-installation submittals, change orders, and change directives. The record documents shall be updated by the Contractor in red pen and on a daily basis, to show the following:

1. Final location of all Communications Outlets, TV Outlets.
2. Final conduit routing.
3. Final location of all handholes, pull boxes, and access doors.
4. Any changes to the work authorized by the Architect/Engineer.
5. Any other pertinent information that may be of value to the Owner in operating and maintaining the system.

The Contractor's record documents shall be available for viewing by the Architect/Engineer or the Owner at the site at any time, and shall be presented and reviewed by the Contractor at each construction progress meeting. The record documents shall be clearly marked "Record Set", shall be kept in a protected location, and shall not be used for general construction purposes. The record documents shall be provided to the Architect/Engineer at the close of the project.

The Architect/Engineer will provide a full set of Adobe Acrobat *.PDF format drawings to the Contractor. The Contractor shall be required to annotate (redline) the Adobe Acrobat *.PDF format drawings using Adobe Acrobat to reflect all changes recorded in the field as required by the paragraph "CONTRACTOR'S RECORD DOCUMENTS". The Contractor shall provide a copy of the Adobe Acrobat *.PDF files on CD with each set of O&M Manuals and shall provide an additional copy on CD to the Architect/Engineer. The Contractor shall also provide 11"x17" laser prints of Adobe Acrobat *.PDF drawings in each O&M Manual.

PART 2 - PRODUCTS

2.1 GENERAL

All materials, equipment, and devices shall be new and unused, of current manufacture and of the highest grade, free from defects.

All products shall be the manufacturer and model or part number specified. Where a model or part number is indicated in error for any reason, the Contractor shall verify the intent of the Architect/Engineer prior to providing a proposal, and shall provide the product intended by the Architect/Engineer. Where a manufacturer has updated or improved a product subsequent to issuance of the bid documents by the Architect/Engineer, the Contractor shall provide the updated or improved product at no additional cost to the Owner.

Provide new equipment and materials only. Each component shall be the most recent model number, revision, or update offered by the manufacturer at the time of purchase by the Contractor. Newly manufactured containing used or rebuilt parts, remanufactured, rebuilt,

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reconditioned, used, shopworn, demonstrator or prototype equipment is not acceptable and will be rejected. Each major component of telephone and data systems equipment provided under this contract shall include a certification from the manufacturer stating that the equipment is new and referencing the serial number of the delivered equipment. The Contractor shall track the placement of each major component in the field, and shall provide the Owner a list identifying each component by manufacturer, model number, serial number, and installed location (example rack number and rack position).

All materials, equipment and devices shall meet the requirements of UL where UL standards are established for those items, and the requirements of NFPA 70.

All like items of material or equipment shall be the same product of the same manufacturer, model number and production series.

All materials and equipment shall be a standard catalogued product of a manufacturer regularly engaged in the manufacture of similar products.

2.2 PRODUCT SPECIFICATIONS

See drawings for all product requirements not indicated in these specifications. The Structured Cabling Contractor shall be responsible for providing and installing all components indicated in these specifications and on the drawings, unless specifically indicated to be provided by others.

2.2.1 Structured Cabling System:

Provide all system components as indicated the drawings. To insure a uniform basis for bidding, and to standardize the Owner's facilities, base all bids on the particular systems, equipment and materials specified.

2.2.2 Data Equipment:

See drawings for data cabling system specifications and equipment mounting requirements.

Data equipment shall be Owner Furnished Owner Installed (OFOI) as indicated on the drawings, unless specifically indicated otherwise.

2.2.3 Telephone System:

See drawings for telephone cabling system specifications.

Telephone equipment shall be Owner Furnished Owner Installed (OFOI) as indicated on the drawings, unless specifically indicated otherwise.

2.2.4 Television System:

See drawings for TV system cabling specifications.

2.2.5 Audio-Visual Systems:

See AV drawings for systems (AV system in Training 101 and listen-in sound system in Canvassing 110/Observation 111. See T drawings for conduit rough-in for AV system in Training 101. For Canvassing 110/Observation 111 listen-in sound system Electrical Contractor coordinate with AV Contractor and provide all conduit, boxes and finished enclosures (in finished spaces) required for a complete and fully functional system.

PART 3 - EXECUTION

3.1 GENERAL

The installation shall be in strict accordance with all applicable codes and standards, the respective manufacturer's written recommendations, and the contract drawings and these specifications.

Workmanship shall be of the highest grade in accordance with the best modern practice and the highest standards of the telecommunications industry.

The installed system shall be neat, clean, and well organized in appearance. Provide working clearances for normal system operation, reconfiguration and repair.

The completed installation shall meet with the approval of the Owner's Project Manager and the Architect/Engineer.

The General Contractor and the Structured Cabling System Contractor shall share full responsibility for protecting all communications outlets, the CER and all structured cabling system components from dust and debris during construction and until final completion of the project. The SCS shall not install racks, wire managers, patch panels, protector blocks, 66 blocks, or dress out and terminate cables until paint, backboards and tile floors in the CER are completely finished and those rooms are completely isolated from dust infiltration with plastic sheeting and duct tape. All CO jacks shall be protected by bagging and sealing dust tight at all times after connectivity devices are installed. All system components that, in the sole judgment of the Engineer, are exposed to excessive accumulation of construction dust/debris at any stage of the project shall be removed and replaced with new components at no additional cost to the Owner. It is recommended that lay-in ceiling grids in the CER and be installed after conduits and cable trays and cable runways have been installed to allow the ceiling installer to trim around conduits. Lay-in ceiling tiles in these areas should follow completion of cable dressing into racks.

3.1.1 Delivery:

Protect materials and equipment from physical or environmental damage during shipping, storage and installation. Equipment and materials shall be received at the site in new condition in original factory sealed cartons, and shall be maintained in new condition throughout the installation process. Damaged or deteriorated equipment and materials will not be acceptable. The Contractor shall be responsible for receiving and storing of all equipment and materials, and shall be responsible for the safety and condition of all materials and equipment, whether stored or installed, until Final Acceptance by the Architect/Engineer and the Owner.

3.1.2 Data Equipment:

Provide a system of data cabling as indicated on the drawings.

Data equipment will be Owner Furnished Owner Installed (OFOI) as indicated on the drawings. The Structured Cabling System Contractor shall be responsible for mounting the equipment in the racks, connecting power to a rack power strip and providing all patching and documentation of patching in an Excel spreadsheet as specified under paragraph 3.3. All equipment configuration shall be provided by the Owner.

Power Cords: The Structured Cabling System Contractor shall provide factory made electrical power extension cords as required to extend power connections from all Owner Furnished data

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equipment to rack power strips. Cords shall route from equipment, up racks attached to standoff brackets as indicated on drawings, and over in cable runway to rack power strips. The Structured Cabling System Contractor shall also all provide factory made electrical power extension cords as required to extend cords from all rack power strips to a rack mounted UPS or to a wall mount 120VAC power outlet as directed by the Owner in the field. Power extension cords shall be black, 20 amp capacity (or heavier if required by the equipment served), heavy duty insulation, length as required to make each connection, properly routed and secured at 12 inches on center, with only one cord allowed per connection, and without excess cord storage.

Coordinate all related work with the Owner.

3.1.3 Telephone System:

Provide a system of telephone premises cabling as indicated on the drawings.

Coordinate all work with the Owner and the Telephone System Provider.

See drawings for specific requirements for structured cabling system interfaces to the telephone system. The contractor shall provide the cabling interfaces indicated.

The Contractor shall inventory all voice connections in coordination with the Owner in the field, along with all other information required to connect all voice services to the structured cabling system and shall complete the cutover and validate the proper operation of all such services and devices.

The Contractor shall identify all voice equipment locations and shall make all required connections of the voice equipment (phones, faxes, modems, etc.) to the equipment via cross-connects in the CER, line cords in the workspace and equipment room voice patch cords in the CER. Provide and install patch cords to interconnect telephone system circuits to horizontal wiring connections as specified herein and as indicated on the drawings.

The contractor shall take special note of the requirements for this section and shall exercise due diligence in assuring that the work is completed in a timely manner and that all voice systems and interfaces are fully functional prior to use by the Owner.

3.1.4 Television System:

Provide a system of TV cabling as indicated on the drawings. The installed system shall comply with all standards set forth in F.C.C. Rules, Part 76.

See drawings for specific requirements.

Coordinate all work with the Owner.

3.1.5 Audio-Visual Systems:

See AV drawings for systems (AV system in Training 101 and listen-in sound system in Canvassing 110/Observation 111. See T drawings for conduit rough-in for AV system in Training 101. For Canvassing 110/Observation 111 listen-in sound system Electrical Contractor coordinate with AV Contractor and provide all conduit, boxes and finished enclosures (in finished spaces) required for a complete and fully functional system.

3.1.6 Conduit Installation:

All conduit shall be installed by a licensed electrical contractor using tradesmen who are skilled and experienced in the types of conduit installations indicated in the bid documents.

All backbone cabling shall be run continuously in conduit.

All special circuit horizontal cabling shall be run continuously in conduit (Fire Alarm dialer and Access Control System Panel).

Do not pull cables in conduits until plastic insulating bushings have been installed. Cables installed in conduits without plastic insulating bushings shall be removed and replaced with new cables.

All conduit shall be installed by a licensed electrical contractor using tradesmen who are skilled and experienced in the types of conduit installations indicated in the bid documents.

Conduit shall be installed with top-grade workmanship, using factory bends or field bends made with the proper tools. Kinked, dented or otherwise improperly constructed bends will not be accepted. All bends shall have a minimum radius of six times the internal conduit diameter.

All conduit shall be routed parallel and perpendicular to building lines, up high and over piping, ductwork, conduit and other utilities. Conduit in exposed locations shall be run as high as possible, hard against the underside of wall, floor, roof or walkway structures at all times, secured with heavy duty galvanized two-hole supports, and otherwise installed to prevent damage from pulling, hanging, etc.

Install plastic insulating bushings on the ends of all indoor conduits prior to installing cables. Provide conduit end fitting with threaded end and threaded plastic insulating bushing.

All threaded conduit joints shall be made watertight. The ends of all conduit runs shall be plugged or capped, immediately after installation, with approved standard factory made plugs or caps to prevent seepage of grout, water or dirt into them. Any conduit section having a defective joint shall not be installed.

All buried conduit shall be Schedule 80 electrical grade PVC conduit. All PVC conduit joints shall be cleaned and glued for a watertight connection. Terminate ends of PVC conduit at closets and handholes with end bells. Seal ends of conduits terminating at ground floor closets watertight after cables are installed to prevent water intrusion into the building.

Seal all underground conduits at building entry points following cable installation to prevent the entry of water into buildings, and to prevent the entry of water or debris into the conduits from the building side. Sealant shall be POLYWATER FST-250 and shall be installed using factory caulking tube, mixing nozzle, damming strips (all included in FST-250KIT1) package.

Firestop all conduit penetrations of all floors and all conduit penetrations of all walls that extend to the underside of the floor or roof deck above. Accomplish firestopping using UL classified systems with fire rating equal to or greater than the fire rating of the floor or wall assembly penetrated. Firestop systems shall be 3M, Nelson or Architect/Engineer approved equal. Install in strict accordance with the manufacturer's printed instructions and the conditions of the UL approval for each firestop system used.

All other penetrations or openings in walls that do not extend to the underside of the floor or roof deck above shall be repaired and sealed with materials to match the wall construction.

Underground Conduit Validation:

Following installation of underground conduits, perform the following operation for each conduit:

Clean, lubricate and validate each installed conduit for serviceability by running a full size rubber duct swab through the conduit from end to end. Conduits that are obstructed may be cleaned using a wire brush mandrel, then revalidated with the full size rubber duct swab. Conduits that do not allow passage of the full size rubber duct swab shall be replaced.

Pull Tapes: As backbone cabling runs are installed, provide a continuous marked pull tape (Carlson TL3821800 lb. tensile strength) for the full length of the end-to-end cable run with 10 feet of slack at each end pulled in alongside cabling. Bundle slack neatly at each end and tie off to conduit support strut at each end. Provide continuous factory uncut lengths of pull tape from end-to-end - under no circumstances shall pull partial length section of pull tape be tied together.

Spare Conduits: For conduits that are indicated as spare, install a continuous marked pull tape (Carlson TL382 1800 lb. tensile strength) for the full length of the end-to-end conduit run with 10 feet of slack at each end, tie each end of the tape to a blank duct plug with rope tie tab, push slack tape back into conduit, and install a duct plug in each conduit end for a watertight seal. The Contractor, in providing a bid for the system in accordance with the contract documents, agrees to install all cabling in the conduit and wireway paths indicated in the contract documents, or to provide larger conduit and wireway paths as he deems necessary, at no additional cost to the Owner. The Contractor shall be fully responsible for any and all damage to cabling that may occur during the installation, and shall replace any damaged cabling with new cabling of the type specified for the application.

3.1.7 Cabling Installation:

Install horizontal cabling shown to be free-routed parallel and perpendicular to building lines, up high and over piping, ductwork, conduit and other utilities, and in protected locations. All cabling shall be neatly and symmetrically bundled (maximum individual bundle size 50 four pair Category 6 cables), bound with black velcro wraps at a minimum of four feet on center, properly supported, and otherwise installed as indicated on the drawings. Support all free-routed horizontal cabling bundles individually with Category 5 J-hooks (Erico "CABLCAT") at a minimum of four feet on center. Attach J-hooks to building structural members only using factory support system components. Secure cables bundles within J-hooks with factory contact free containment cable ties. Do not attach J-hooks to ceiling grids, ceiling supports, piping, ductwork, conduit or anything other than building structural members unless specifically approved by the Engineer. Do not support free-routed horizontal cabling by running over or directly attaching to building structural members, piping, ductwork, conduit or any other utility.

Conduit sleeves for horizontal CAT 6 and RG-6 coaxial ITV cabling: Final routing paths for horizontal cabling shall be determined by the contractor in the field. For this reason conduit sleeves are not indicated on the drawings. The contractor shall provide EMT conduit sleeves in the quantities and locations required to suit the contractor selected horizontal cable routing and as required for a complete installation, regardless of whether those sleeves are indicated on the drawings or not, and at no additional cost to the Owner. At all locations where horizontal cabling runs through mechanical or electrical equipment rooms, storage rooms, or any other type of room with exposed structure ceiling, all such cabling shall be run in continuous conduit sleeves extending to the nearest accessible lay-in ceiling at both ends. In addition, the contractor shall provide conduit sleeves traversing inaccessible (hard) ceiling or soffit areas and extending to the nearest accessible lay-in ceiling at both ends for cable pass-thru - provide access panels in inaccessible ceilings as required to install sleeves. In finished spaces with exposed roof structure that contain outlets, run continuous sleeves up high and extend to lay-in ceilings on either end -

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drop conduits from pull boxes mounted in sleeves over to outlets within such spaces - convert to surface raceway at 9'-0" above finished floor or at other future ceiling height as directed by the Owner's project manager. Sleeves shall be sized for maximum 30 percent cable fill and shall be constructed and provided with pull boxes and access doors per the general aboveground conduit notes on the drawings. General contractor paint exposed conduit sleeves in all finished/occupied spaces with no ceilings to match adjacent surfaces.

Provide wire management devices on backboards and racks as indicated and as required to facilitate organized routing of cables and patch cords. Bundle cables together behind racks and fan out to points of termination. The finished installation shall meet the approval of the Engineer for overall quality and neatness of appearance.

The Contractor, in providing a bid for the system in accordance with the contract documents, agrees to install all cabling in the conduit and wireway paths indicated in the contract documents, or to provide larger conduit and wireway paths as he deems necessary, at no additional cost to the Owner. The Contractor shall be fully responsible for any and all damage to cabling that may occur during the installation, and shall replace any damaged cabling with new cabling of the type specified for the application.

Firestop all cable and sleeve penetrations of all floors and all cable penetrations of all walls that extend to the underside of the floor or roof deck above. Accomplish firestopping using UL classified systems with fire rating equal to or greater than the fire rating of the floor or wall assembly penetrated. Firestop systems shall be 3M, Nelson or Engineer approved equal. Install in strict accordance with the manufacturer's printed instructions and the conditions of the UL approval for each firestop system used.

All other penetrations or openings in walls that do not extend to the underside of the floor or roof deck above shall be repaired and sealed with materials to match the wall construction.

3.1.8 Identification and Labeling:

The Structured Cabling System Contractor shall purchase and use specific purpose labeling products to generate all labels for this project, with the exception of engraved plastic tags and laminated paper tags, which shall be fabricated as indicated on the drawings, and elsewhere as indicated below.

All labels shall be produced using a laser printer and shall be clear and easily readable. Minimum text size shall be 12 point. Text font shall be ARIAL. Handwritten labels are not acceptable.

Label each horizontal cable and backbone cable using self-adhesive self-laminating polyester wrap-around labels with laser printed text as follows:

- Label each Horizontal Category 6 cable at each end. Label text shall be based on the nomenclature indicated on the drawings.
- Label each Fiber Optic Backbone and Voice Backbone Cable at each end. Label text shall be based on the nomenclature indicated on the drawings.

Label each Communications Outlet using non-adhesive card labels with laser printed text. Insert labels under outlet manufacturer's plastic label covers centered and straight. Label text shall be based on the 'CO Identification Nomenclature' indicated on the drawings.

Label each Category 6 Horizontal Patch Panel port using self-adhesive labels. The Contractor shall first attach the adhesive labels to the perforated paper labels supplied by the patch panel

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manufacturer, then insert the paper labels into the plastic covered icon-label holders supplied by the patch panel manufacturer. Label text for each patch panel port shall be based on the 'Horizontal Patch Panel Labeling Nomenclature' indicated on the drawings.

Label each Backbone Fiber Optic Cable Drawer with 1" high bold text printed on clear self-adhesive paper and attached to the reverse side of drawer manufacturer's paper label. Label text shall be based on the 'Fiber Optic Backbone Cable Nomenclature' indicated on the drawings to indicate source and destination (CER).

Label each Rack, Enclosure/Cabinet, Voice Protector Block, Voice Backbone Patch Panel and other devices as indicated on the drawings.

Label each Main Conduit at each end with ½" high bold text printed on heavy stock paper and secured to conduit with clear self-adhesive sheets covering the label and extending out beyond the label 1" all around for adhesion to the conduit. Label text shall be based on source and destination (CER).

Provide data sheets describing all proposed labeling products with Pre-installation Submittals.

3.2 CABLE TESTING

3.2.1 General:

Prior to installation of cabling, visually inspect all cables, cable reels, and shipping cartons to detect possible cable damage incurred during shipping and transport. Return visibly damaged goods to the supplier and replace with new.

If post-manufacture performance data has been supplied by the manufacturer of cables or connecting hardware, copies of such data are to be kept for inclusion in the Documentation and made available to the Owner upon request.

After cabling installation and labeling is complete, but prior to the installation of patch cords, the Contractor shall test all cables. *As part of cable test procedures verify all labeling and correct all inaccurate labeling.*

The Contractor's RCDD shall be in responsible charge of all cable testing procedures and shall provide an original signed letter in each project Operation & Maintenance (O&M) manual certifying that all cables have been tested in compliance with the contract documents and have met or exceeded the requirements stated therein.

Tests shall be performed in strict accordance with the test instrument manufacturer's printed instructions.

One hundred percent of all cables shall be tested.

Technicians performing testing shall be thoroughly trained in the use of the test instruments employed. Factory certification of technicians is mandatory. The Contractor shall provide evidence of training and copies of certificates to the Architect/Engineer.

The Contractor is responsible for supplying all test equipment and related materials required to test the entire Structured Cabling System. Test instruments shall be calibrated and traceable to the National Institute of Standards (NIST). Test instruments shall have been recently calibrated. The Contractor shall provide evidence of test instrument calibration if requested by the Architect/Engineer.

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The requirement for this project is full compliance/zero tolerance. Cables that do not comply with the stated standards shall be removed and replaced with new. Partial use of cables by claiming good pairs or strands and abandoning others is not allowable. Defective cables shall be removed and replaced with new.

Notify the Owner in writing not less than five days prior to commencing cable testing. The Owner may elect to be present for and witness cable testing.

The Contractor shall be required to retest installed cables in the Owner's presence to verify the Contractor's test documentation. The percentage of cables to be retested shall be determined by the Owner based on compliance of the installation with the contract documents, quality of workmanship, and results of initial cable tests. Retesting shall be performed as required until all cables, in the judgment of the Owner, comply with the requirements of the contract documents.

3.2.2 Cable Test Results:

All cable test results shall be provided as part of the project Installation and Maintenance (O&M) Manuals.

3.2.3 Category 6 UTP Cable Testing:

Testers:

Each Category 6 cable shall be tested with Fluke Networks DSP-4300 Digital Cable Analyzers utilizing Fluke Networks DSP-LIA101 Universal Permanent Link Interface Adapters and the appropriate Personality Modules. In addition, each tester shall be calibrated prior to commencing testing for this project using a Fluke Networks DSP-PLCAL Universal Permanent Link Calibration Kit and Fluke Networks 'Cable Manager' software.

Prior to testing, electronically update tester software using the tester manufacturer's 'Cable Manager' software update utility. Update to the software version current at time tests are performed. Under no circumstances shall a tester with outdated software be used.

General:

Testing shall be of the Permanent Link. However, the Structured Cabling System Contractor and the Structured Cabling System Manufacturer shall warrant performance based on Channel performance and provide shall patch cords that meet Channel performance requirements.

All test results shall be maintained in the native file format of the tester manufacturer's 'Cable Manager' software. Under no circumstances shall be data be modified by other software, edited in any manner, or exported to a database, spreadsheet, word processor program or any other type of program that would allow access to the data for modification. Hardcopy printouts of test reports in Summary Format shall be generated directly from the 'Cable Manager' software. Detailed test results in Text Format shall be provided to the Owner in native 'Cable Manager' data format on a CD. In addition, detailed test results in Text Format shall be provided to the Owner in Adobe Acrobat *.PDF format on a CD. CDs shall be included in the project Operation and Maintenance (O&M) manuals.

Record all test conditions and setup parameters and include in a typed discussion to be provided with test documentation.

Verify correct labeling of patch panels and communications outlets prior to and during testing. If any label is found to be in error, correct before proceeding with testing. Circuit Identification

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(cable I.D.) in cable test reports shall be exactly the same as the outlet labeling based on the nomenclature indicated on the drawings.

Testing:

After installation, termination and labeling of the Category 6 UTP cable is complete and approved by the Structured Cabling System Contractor's RCDD, test each cable in accordance with all applicable TIA/EIA standards for UTP Category 6, and complete all operations required for a Factory Certified Cabling System and 20 year Factory System Warranty.

Prior to testing, electronically update tester software using the tester manufacturer's 'Cable Manager' software update utility. Update to the software version current at time tests are performed. Under no circumstances shall a tester with outdated software be used.

Test each cable to verify compliance with TIA/EIA specifications for Category 6 UTP, Permanent Link configuration, Level III accuracy, with no allowable deviation. Test at the full range of frequencies indicated by TIA/EIA up to and including 250 MHz.

Test using the tester manufacturer's standard TIA/EIA Category 6 Autotest. Under no circumstances shall a Custom Cable Autotest designed by the tester manufacturer specifically for a given cable manufacturer or structured cabling system manufacturer be used to test cables. All tests and testing procedures for this project shall be strictly based on TIA/EIA standards. Enter the proper Nominal Velocity of Propagation (NVP) for the specific cable(s) installed. Test for the following parameters:

1. Wire Map – verify no shorts, opens, miswires, split, reversed or crossed pairs, and end-to-end connectivity is achieved.
2. Cable Length
3. Insertion Loss (attenuation)
4. NEXT Loss
5. PSNEXT Loss
6. ELFEXT Loss
7. PSELFEXT Loss
8. Return Loss
9. ACR
10. PSACR
11. Propagation Delay
12. Delay Skew

Documentation:

Test documentation for Category 6 cabling shall include the following:

1. An introductory discussion documenting each test instrument used, the Autotest routine used on each test instrument, qualifications of operators, test conditions, setup parameters, and any other pertinent information.
2. A summary hardcopy printout for all cables using the tester manufacturer's standard 'Cable Manager' software to produce an "AutoTest Summary" report. The summary report shall include Project Name, Circuit I.D., Result (pass or fail) and the cable length. The report shall be printed directly out of the 'Cable Manager' program in native format and in *.PDF format – under no circumstances shall the data be exported to any other type of program at any time.
3. A full-page text only detailed test result for each cable using the tester manufacturer's

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standard 'Cable Manager' software to produce an "AutoTest Report". Each report shall be printed directly out of the 'Cable Manager' program in native format and in *.PDF format - under no circumstances shall the data be exported to any other type of program at any time. Each report shall include the following components:

- Tester manufacturer, model, serial number, hardware version, and software version
- Project Name
- Operator Name
- Cable manufacturer, cable part number/type and NVP
- Circuit I.D.
- Autotest specification used (must be standard TIA Category 6 autotest)
- Identification of the tester interface used
- Overall pass/fail indication
- Date of Test
- Wire Map
- Cable Length in feet
- Insertion Loss (attenuation)
- NEXT Loss*
- PSNEXT Loss*
- ELFEXT Loss*
- PSELFEXT Loss*
- Return Loss*
- ACR*
- PSACR*
- Propagation Delay
- Delay Skew

* Measure from both ends of each cable

5. A PASS or FAIL result for each parameter shall be determined by comparing the measured values with the specified test limits for that parameter. The test result for each parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer shall provide documentation as an aid to interpret results marked with asterisks.

Each individual test that fails the relevant performance specifications shall be marked as FAIL or FAIL*. Any FAIL or FAIL* result yields a FAIL rating for the link-under-test. In order to achieve an overall PASS rating, the results for each individual test parameter must yield a PASS or PASS* result.

6. In certain cases, the project may include a small number of Category 6 cables with installed lengths in excess of the TIA/EIA standards. The Structured Cabling System Contractor, after having made every reasonable effort to route all cables in accordance with TIA/EIA standards for length, shall inform the Architect/Engineer when those standards cannot be met, and shall provide estimates of cable lengths to the Architect/Engineer. The Architect/Engineer and the Owner may agree to allow certain cabling runs to exceed standards for length in the interest of controlling project cost. In this event, the certification report for each such run shall be explicitly identified as "Approved Over-Length Cable". Such cables shall be excluded from requirements to pass standardized tests, but the Contractor shall make every effort to obtain the maximum performance from the associated link. Each over-length cable shall be fully tested and the test results provided as required for all Category 6 cables.
7. Cable identities (Circuit IDs) shall be based on the labeling nomenclature described on the drawings.

8. Transfer of Software to Owner: Provide tester manufacturer's 'Cable Manager' software, latest version, to the Owner for the Owner's use in viewing and managing test results.
9. Provide all Category 6 cable test documentation in the project O&M Manuals.

Category 6 Cable Performance Criteria:

If the test results for a given cable or cables, in the sole judgment of the Architect/Engineer, fail to confirm acceptable performance, the Contractor shall reconnectorize or replace with new the affected cables as required to achieve specified performance levels as demonstrated by retesting.

3.2.4 Fiber Optic Cable Testing:

General:

Clean all fiber optic connectors, sleeves and test cords prior to testing. Follow all other recommendations of the test instrument manufacturer for cable and instrument preparation.

Record all test conditions and setup parameters and include in a typed discussion to be provided with test documentation.

On-the-Reel-Testing:

Before commencing the installation and with the cable on the reel, test at least one fiber strand on each cable reel to verify that the cable is undamaged. Record and print test results for future reference.

Post-Installation Testing:

After installation, termination and labeling of fiber optic cable is complete and approved by the Structured Cabling System Contractor's RCDD, test each strand of fiber to verify that the installed cable meets the performance requirements described below. Test in accordance with TIA/EIA-568-B with the additional (and more stringent) requirements following:

Test fiber using the Fluke Networks DSP-4300 Digital Cable Analyzers specified for Category 6 UTP cable in combination with Fluke Networks DSP-FTA440S Gigabit Multimode Fiber Test Adapters. The DSP-FTA440S Fiber Test Adapter uses a VCSEL source at 850nm and a FP Laser light source at 1310nm for testing multimode fiber running Gigabit Ethernet. Test as follows:

1. Test two fiber links at the two specified wavelengths simultaneously. Perform bi-directional testing on both strands of the fibers-under-test and save results in one record.
2. Measure length for each cable link.
3. Measure attenuation for each cable link.
4. Utilize Fluke Networks 'Cable Manager' software to store test results and to generate reports.

Test results shall include all test parameters including length and attenuation at each wavelength for each fiber link (terminated strand). Attenuation shall be the worse case result yielded from bi-directional testing. All test results shall be maintained in the native file format of the tester manufacturer's 'Cable Manager' software. Under no circumstances shall be data be modified by other software, edited in any manner, or exported to a database, spreadsheet, work processor program or any other type of program that would allow access to the data for modification. Detailed test results in Text Format shall be provided to the Owner in native 'Cable Manager' data format on a CD. In addition, detailed test results in Text Format shall be provided to the Owner in Adobe Acrobat *.PDF format on a CD. CDs shall be included in the project Operation and

Maintenance (O&M) manuals.

Insert all fiber optic cable test documentation in the project O&M manuals.

Fiber Optic Cable Performance Requirements:

Each link of the installed fiber optic cabling, with mated connectors at each end, shall have a total attenuation (in db) less than or equal to the manufacturers' performance specifications for the cable and connectors called for in the contract documents, with the cable attenuation adjusted for the installed length, and with an allowable deviation of +1.0 db. If the test results for a given strand or strands, in the sole judgment of the Architect/Engineer, indicate excessive attenuation based on these requirements, the Contractor shall repolish, reconnectorize, or replace the affected cables as required to achieve the specified performance levels as demonstrated by retesting.

The Contractor should note that these specifications are more stringent than the TIA/EIA-568-B criteria for either horizontal or backbone fiber lengths in terms of allowable link attenuation, and plan the installation accordingly.

3.2.5 Multi-pair Telephone Cable Testing:

Test each conductor for end-to-end continuity. Test each cable for correct termination on a pin-by-pin basis. Verify no shorts, opens, miswires, split, reversed or crossed pairs. Document results of testing and submit to Architect/Engineer for review and approval. The test log shall include cable identifiers as indicated on the drawings, the test date, the initials of the technician who tested the cable, and the test results.

Insert all multi-pair telephone cable test documentation in the project O&M manual.

3.3 Patch Cord Installation:

Prior to Equipment Verification, the contractor shall install patch cords in a neat and workmanlike manner using the wire management devices indicated on the drawings. The contractor shall work side by side with the Owner's technical personnel throughout the entire patch cord installation for purposes of coordination and training.

Prior to installation of patch cords, the contractor shall account for all patch cords in the presence of the Owner's Project Manager, and shall present to the Project Manager a typed inventory of the patch cords broken down by type and length as scheduled on the drawings. The Owner's Project Manager will verify patch cord types, quantities, and lengths and will sign the inventory indicating that the contractor has delivered patch cords to the job site in accordance with the requirements of the contract documents. The contractor shall provide a copy of the inventory, signed by the Owner's Project Manager, in the O&M Manuals.

The signature of the Owner's Project Manager does not indicate acceptance of ownership of the patch cords by the Owner. Ownership of patch cords shall be transferred to the Owner at the same time as the project as a whole.

Following verification of patch cords types, quantities and lengths by the Owner's Project Manager, the contractor shall complete the patch cord installations as follows:

3.3.1 Data Copper Patch Cords – CER:

Install data patch cords connecting each port of all data equipment from data equipment connections to horizontal patch panels. Horizontal wiring connections to be made active shall be

as directed by the Owner's Project Manager in the field.

Provide a typed cross-reference list in Microsoft Excel spreadsheet format identifying data equipment ports and corresponding horizontal wiring connections – place hardcopy and CD of spreadsheet in three ring binder and mount binder on the backboard adjacent to the racks. Provide additional hardcopy and CD in O&M Manuals. Email copy of Excel Spreadsheet to the Architect/Engineer and the Owner's Project Manager.

Patch cords shall be neatly routed and bundled with black velcro at 6 inches on center in wire management devices from connection to connection. Patch cord lengths shall be selected by the

Contractor from the stock supplied under the project to provide a neat installation in the racks and wire management systems without excess length. Note - Bundle data patch cords together – do not mix data patch cord bundles with voice patch cord bundles or fiber optic patch cord bundles. The entire installation shall require the site approval of the Architect/Engineer.

3.3.2 Voice Patch Cords – CER:

Install voice patch cords connecting telephone system station circuits from voice backbone distribution patch panels to horizontal patch panels. Horizontal wiring connections to be made active shall be as directed by the Owner's Project Manager in the field.

Provide a typed cross-reference list in Microsoft Excel spreadsheet format identifying telephone system station circuits to voice backbone distribution patch panel ports to horizontal wiring connections – place hardcopy and CD of spreadsheet in three ring binder and mount binder on the backboard adjacent to the racks. Provide additional hardcopy and CD in O&M Manuals. Email copy of Excel Spreadsheet to the Architect/Engineer and the Owner's Project Manager.

Patch cords shall be neatly routed and bundled with black velcro at 6 inches on center in wire management devices from connection to connection. Patch cord lengths shall be selected by the Contractor from the stock supplied under the project to provide a neat installation in the racks and wire management systems without excess length. Note - Bundle voice patch cords together – do not mix voice patch cord bundles with data patch cord bundles or fiber optic patch cord bundles. The entire installation shall require the site approval of the Architect/Engineer.

3.3.3 Fiber Patch Cords – CER:

Install fiber optic patch cords to connect all data equipment fiber optic ports as directed by the Owner's Project Manager in the field. Patch cords shall be neatly routed and bundled with black velcro at 3 inches on center in wire management devices from connection to connection. Patch cord lengths shall be selected by the Contractor from the stock supplied under the project to provide a neat installation in the racks and wire management systems without excess length. Note - Bundle fiber optic patch cords together – do not mix fiber optic patch cord bundles with data patch cord bundles or voice patch cord bundles. The entire installation shall require the site approval of the Architect/Engineer.

3.3.4 Workstation Patch Cords

The Contractor shall, in coordination with the Owner's Project Manager, install workstation data patch cords in the locations designated by the Project Manager as described above for connection of equipment room data patch cords to horizontal wiring connections. In addition, the Contractor shall work side by side with the Telephone System Provider to install telephone line cords as telephone instruments are set.

3.4 EQUIPMENT VERIFICATION

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After installation of patch cords and before System Startup, the Contractor shall assist the Owner to power-up all data equipment and verify proper operation. The Contractor shall coordinate with the Owner to verify all cable interfaces are working and operational with the equipment. The contractor shall make any cabling system changes and additions as necessary and/or provide patch cables as required to complete the installation.

3.5 SYSTEM STARTUP

After Equipment Verification and before Final Checkout, the Contractor shall start the systems up, and in coordination with the Owner make them fully operational.

3.6 FINAL CHECKOUT

After System Startup and before the First Day of operation following System Startup, the Contractor shall perform a Final Checkout of all systems to verify that each is ready for use by Owner personnel. The Contractor shall utilize a Final Checklist to fully document Final Checkout. Provide a copy of the Final Checklist to the Architect/Engineer at the Final Inspection.

3.7 FIRST DAY of OWNER OPERATION

The Contractor shall have a senior technician present at the site for the first full 8 hour day of operation following the Final Checkout to train/assist Owner personnel and to verify/fine tune system operation. The senior technician shall make follow-up visits as required to bring the system into full operating condition to the satisfaction of the Owner's Project Manager and the Architect/Engineer.

3.8 FINAL CLEANUP

The General Contractor and the Structured Cabling System Contractor shall share full responsibility for protecting all communications outlets, the CER and all structured cabling system components from dust and debris during construction and until final completion of the project. The SCS shall not install racks, wire managers, patch panels, protector blocks, 66 blocks, or dress out and terminate cables until paint, backboards and tile floors in the CER are completely finished and those rooms are completely isolated from dust infiltration with plastic sheeting and duct tape. All CO jacks shall be protected by bagging and sealing dust tight at all times after connectivity devices are installed. All system components that, in the sole judgment of the Engineer, are exposed to excessive accumulation of construction dust/debris at any stage of the project shall be removed and replaced with new components at no additional cost to the Owner. It is recommended that lay-in ceiling grids in the CER be installed after conduits and cable trays and cable runways have been installed to allow the ceiling installer to trim around conduits. Lay-in ceiling tiles in these areas should follow completion of cable dressing into racks.

Prior to the Substantial Completion Inspection, perform final cleanup of all work and all areas in which work was performed. All work areas shall be left vacuum clean. All raceway, faceplates, jack assemblies, racks, panels, data equipment, and the like shall be thoroughly wiped down to remove small amounts of dust accumulated during the course of the project. Jacks, patch panels, wiring blocks and data, and voice equipment shall be cleaned with a high powered vacuum cleaner to completely remove internal dust. All painted surfaces such as backboards shall be touched up with paint to remove scuff marks, pencil marks, scratches, etc. All factory surfaces shall be touched with matching paint.

3.9 CLOSE-OUT DOCUMENTATION

3.9.1 Operation & Maintenance Manuals:

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Provide O&M Manuals as required by the architectural specifications and as follows.

The O&M Manuals shall contain sufficient information to permit Owner personnel to operate the system with or without assistance from the Contractor.

The Contractor shall provide O&M Manuals covering all equipment and materials furnished under this contract. The O&M Manuals shall contain all information necessary for the operation, maintenance, parts procurement, and parts replacement for the structured cabling system. The information shall include detailed documentation for firmware configuration. Quantity: Three (3). Format: *Provide 8-1/2" x 11" loose-leaf 3-ring binders with clear vinyl overlay designed to receive identification inserts. 3-ring binders shall be heavy-duty D-Ring type, over-sized to allow the insertion of additional system documentation in the future.*

Project Identification: Furnish project identification *inserted under the clear vinyl overlay on the front cover and the back spline as follows*:

Operating & Maintenance Manual
Project Name
Structured Cabling System Contractor

Project Information: On the front page, *enclosed in a 3-ring clear plastic sheet protector*, provide the following information:

Project Name
Structured Cabling System Contractor Name
Structured Cabling System Manufacturer Name
Electrical Contractor Name
Contractor's Project Manager
Contact list with name, address, contact person, phone number, and fax number for the each of the following:

Structured Cabling System Contractor
Structured Cabling System Manufacturer
Electrical Contractor

Index: On the second page, *enclosed in a 3-ring clear plastic sheet protector*, provide an index indicating the following section numbers and titles.

Sections: All sections shall be separated with an appropriate tabbed section divider with the appropriate number and title (typed) as follows:

Section 1 – Cuts Sheets:

Manufacturer's original data/cut sheets for each system component.

Section 2 – Data Equipment List:

Typed list of each item of data equipment (including Owner furnished data equipment) with brief description, serial number, and part number. Note where each item of equipment is installed (CC number, rack number and mounting position in rack). *Enclose in a 3-ring clear plastic sheet protector.*

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Section 3 – Factory Manuals:

Manufacturer's printed Installation and Operating Manuals for each item of equipment provided by the Contractor. *Provide 3-ring zip-lock pockets for each manual that is not factory 3-ring hole punched.* Do not include manuals loose or inserted in binder pockets.

Section 4 - Warranties:

- Copy of Structured Cabling System Contractor and Manufacturer's 20 year warranty. *Enclose in a 3-ring clear plastic sheet protector.*
- Copy of Manufacturer's printed warranty for each item of equipment. *Enclose in a 3-ring clear plastic sheet protector.*

Section 5 - Transmittal of Loose Items:

Copy of transmittal of all loose items such as patch cords, spare surge protectors, spare parts, etc. signed-off by the Owner. *Enclose in a 3-ring clear plastic sheet protector.*

Section 6 - Documentation of Training:

Documentation of training signed-off by the Owner's Project Manager. *Enclose in a 3-ring clear plastic sheet protector.*

Section 7 - Cable Test Results:

Part 1 – RCDD Certification:

Provide written Certification of Contractor's RCDD, stating that all fiber optic, Category 6 and multi-pair telephone cables have been tested in compliance with the contract documents and have met or exceeded the requirements stated therein. *Enclose in a 3-ring clear plastic sheet protector.*

Part 2 – Executive Summary:

Provide Hardcopy Summary Report of test results in the following divisions:

- Category 6 Cabling – Generate report directly from Fluke Networks 'Cable Manager' software.
- Fiber optic horizontal cabling – Generate report directly from Fluke Networks 'Cable Manager' software.
- Fiber optic backbone cabling – Generate report directly from Fluke Networks 'Cable Manager' software.
- Multi-pair telephone cabling.
- TV Coaxial Cabling.

Enclose each report in a 3-ring clear plastic sheet protector.

Part 3 – Fiber Optic Cables:

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Provide detailed printed test results for all fiber optic cables.
Test results shall be printed on a laser printer. Enclose hardcopy in a 3-ring clear plastic sheet protector.

Part 4 – Category 6 Cables:

Provide CD with Category 6 cable text only test results in native Fluke Networks 'Cable Manager' software *.FCM format and in Adobe Acrobat *.PDF format. *Place CD in 3-ring clear plastic CD jacket.*

Part 5 – Fiber Optic Horizontal Cables:

Provide CD with fiber optic horizontal cable test results in native Fluke Networks 'Cable Manager' software *.FCM format and in Adobe Acrobat *.PDF format. *Place CD in 3-ring clear plastic CD jacket.*

Part 6 – Fiber Optic Backbone Cables:

Provide CD with fiber optic backbone cable test results in native Fluke Networks 'Cable Manager' software *.FCM format and in Adobe Acrobat *.PDF format. *Place CD in 3-ring clear plastic CD jacket.*

Part 7 – Multi-pair Telephone Cables:

Provide Printed test results for all multi-pair telephone cables.
Test results shall be printed on a laser printer. Enclose hardcopy in a 3-ring clear plastic sheet protector.

Part 8 – Coaxial TV Cables:

Provide Printed test results for all Coaxial TV cables and for signal level at each TV outlet. Test results shall be printed on a laser printer. Enclose hardcopy in a 3-ring clear plastic sheet protector.

Section 8 - Patch Cord Spreadsheet (voice and data):

Provide Hardcopy and CD of Excel Spreadsheet file. *Enclose hardcopy in a 3-ring clear plastic sheet protector. Place CD in 3-ring clear plastic CD jacket.*

Section 9 – Annotated Adobe Acrobat *.PDF As-Built Drawings.

Provide 11"x17" hardcopy laser prints and CD of *.PDF files.
Enclose hardcopy in a 3-ring clear plastic sheet protector. Place CD in 3-ring clear plastic CD jacket.

3.9.2 As-Built AutoCAD Drawings:

Provide the same AutoCAD drawings as required under paragraph "Pre-Installation AutoCAD Drawings". Modify and correct to accurately reflect the finished installation. Provide five (5) hard-copies and two (2) sets of electronic media.

Submit As-Built AutoCAD Drawings to the Architect/Engineer at the Substantial Completion Inspection. Provide transmittal letter addressed to the Architect/Engineer indicating that the Contractor is providing five (5) hard-copies and two (2) sets of electronic media of the As-Built AutoCAD Drawings.

3.9.3 Red-Line Record Documents:

Refer to paragraph "CONTRACTOR'S RECORD DOCUMENTS". Provide Record Documents, updated in red pen, to accurately reflect the finished installation.

Submit Red-Line Record Documents over to the Architect/Engineer at the Substantial Completion Inspection. Provide transmittal letter addressed to the Architect/Engineer indicating that the Contractor is providing one (1) set of Red-Line Record Documents.

3.9.4 Annotated Adobe *.PDF A-Built Drawings:

The Architect/Engineer will provide a full set of Adobe Acrobat *.PDF format As-Built Drawings to the Contractor. The Contractor shall be required to annotate (redline) the *.PDF format drawings using Adobe Acrobat to reflect all changes recorded in the field as required by the paragraph "CONTRACTOR'S RECORD DOCUMENTS". The Contractor shall provide a copy of the *.PDF files on CD with each set of O&M Manuals and shall provide an additional copy on CD to the Architect/Engineer. The Contractor shall also provide 11"x17" hardcopy laser prints of *.PDF drawings in each O&M Manual.

3.10 SUBSTANTIAL COMPLETION

Complete Final Checkout of system operation, Final Checklist, Cable Test Results, O&M Manuals and Record Documents prior to Substantial Completion. The Contractor's project manager and project senior technician shall be present for the Substantial Completion Inspection.

3.11 OWNER PERSONNEL TRAINING

Owner personnel training shall be provided for the Structured Cabling System. The cost of training shall be included in the cost of the system. Two copies of all manuals and training material shall be supplied to the Owner's Project Manager at no additional cost.

The Owner's Project Manager shall be notified prior to each training session and may participate in the training at his or her discretion.

All instruction shall be presented in an organized and professional manner by personnel who are thoroughly familiar with the installation and who certified by the manufacturer of the specific system and/or equipment for which they are providing training.

The Structured Cabling System Contractor shall provide documentation of all training (including names of personnel present at each training session) to the Architect/Engineer at the Final Completion Inspection. The documentation shall be signed-off by the Owner. The documentation shall be three-hole punched and ready for insertion in the O&M manuals.

3.11.1 Structured Cabling System Training:

Subsequent to Substantial Completion but prior to Final Completion, the Contractor shall provide on-site training to Owner personnel on the operational use of the Structured Cabling System and the all related equipment.

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The Structured Cabling System Contractor shall schedule a time to provide not less than eight (8) hours of formal training to Owner personnel on the Structured Cabling System. The Structured Cabling System Contractor shall provide an additional four (4) hours of follow-up training on the system when requested by the Owner at any time during the warranty period. Follow-up training shall be given in two 4 hour periods.

Structured Cabling System training shall include a "walk-through" of the systems to identify and locate closets, panels, and important system components, a discussion of overall system concepts and configuration, specific instruction in labeling and patch cord move/changes, a review of the as-built drawings, a review of the system verification and acceptance documentation, and guidelines for basic trouble-shooting and operation of the Structured Cabling System and all related equipment.

3.12 FINAL COMPLETION

Following completion of punch list items generated by the Architect/Engineer following the Substantial Completion Inspection, the Contractor shall notify the Architect/Engineer in writing, stating that all punch list items have been completed.

3.13 WARRANTY

The Structured Cabling System Contractor warrants all work performed by him directly and all work performed for him by others for a period of three years. Any work, material or equipment which during the warranty period is, in the opinion of the Architect/Engineer or the Owner's Project Manager, defective or inferior and not in accordance with the contract documents, shall be made good at no additional cost to the Owner, including any other work which may have been damaged because of such deficiencies. The Contractor shall be the contact person and the person responsible for coordinating all warranty work for the Owner.

When equipment cannot be repaired at the site, the Contractor shall be completely and solely responsible for the coordination and completion of equipment repairs, including pickup at the project site, transportation and shipping costs to and from the repair site, and reinstallation and reintegration into the system. Equal or better loaner equipment shall be provided and installed by the Contractor any time equipment cannot be repaired at the site, so that the system is maintained in continuous working order as before the equipment failed.

END OF SECTION 17000

PROJECT MANUAL FOR
 ESCAMBIA COUNTY SUPERVISOR OF ELECTIONS
 WAREHOUSE RENOVATION

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